CEREBRAL PALSY, ONLINE SOCIAL NETWORKS AND CHANGE

VOLUME 1

PHD IN HUMAN-COMPUTER INTERACTION

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"In loving memory of Valerie Ann French who lost her fight to cancer during the completion of this PhD in Human-Computer Interaction. You were a pillar of love, support and admiration throughout my life. This doctoral thesis is dedicated to you."

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Thesis Declaration

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Abstract

In 2011, 19.2 million households in the United Kingdom had access to the Internet. Online social networks (OSN) such as Facebook, Twitter, MySpace, Bebo and YouTube have proved to be the most popular Internet activity (Office of National Statistics, 2011). 49% of these users have updated or created an OSN profile and are making over 24 million visits a month (Dutton, 2009). These websites are often directed at a broad market i.e. people without disabilities. Unfortunately people with disabilities, especially those with physical impairments, often have a greater risk of experiencing loneliness than people without a disability as a result of their mobility, access and or communication impairments.

Conventional communication methods such as face-to-face communication, telephone communication and text message communication are often difficult to use and can limit the opportunities for people with disabilities to engage in successful socialisation with family members and friends (Braithwaiteet al, 1999). Therefore people with disabilities can often see online communication, especially OSNs, as an attractive alternative.

Previous studies such as Braithwaite et al(1999), Ellis and Kent (2010) and Dobransky and Hargittai (2006) suggests that OSNs are opening a new world to individuals with disabilities. They help these individuals, especially those exhibiting lifelong physical challenges to carry out social interaction which they would otherwise not be able to do within the analogue world. However due to inaccessible features presented in the technology for example features requiring JavaScript, hard-coded text size and Captcha (AbilityNet, 2008; Cahill and Hollier, 2009 andAsuncion, 2010) access to OSNs is often difficult.

The overarching purpose of this PhD research is to understand the experiences and challenges faced when people with the physical disability cerebral palsy (cp) use OSNs. It is estimated that 1 in 400 children born in the UK is affected by cp (Scope Response, 2007). The disability can present itself in a variety of ways and to varying degrees. There is no cure for cp, however management to increase social interaction especially through technological innovations is often encouraged (United Cerebral

Palsy, 2001; Sharan, 2005 and Colledge, 2006). Previous studies such as AbilityNet (2008), Cahill and Hollier (2009), and Boudreau (2011) have explored mainstream OSNs use from the perspective of users with disabilities, i.e. blind and visually or cognitively impaired, but have placed great emphasis on investigating inaccessibility of OSNs without involving these users.

Other studies such as Manna (2005) and Belchiorb et al (2005) have used statistical methods such as surveys and questionnaires to identify Internet use among people with unspecified disabilities. Conversely Asuncion (2010) has taken a broader approach involving OSN users using high-level taxonomies to classify their disabilities, and Marshall et al (2006) focused on a specific disability type, cognitive impairments, without considering the variety of limitations present within the disability. Other studies such as Pell (1999) have taken a broader yet more specific approach and looked at technology use, especially computer and assistive technology among people with physical disabilities, where only 7 out of 82 surveyed had cp. Whereas Braithwaiteet al (1999) focused on individuals with disabilities, where most were classified has having a physical disability. However the study does not explicitly look at OSNs but rather at online social support within forums for people with disabilities.

Studies such as these have not involved the users; defined what constitutes disability or focused on cp without encompassing other disabilities, making it impossible to identify the requirements of OSN users with cp.

Initially this PhD research explored the experiences and challenges faced when individuals with cp use OSNs. Fourteen interviews were carried out consisting of participants with variations of the disability. The study identified the reasons for OSN use and non-use and also discovered key themes together with challenges that affected their experiences. This work was followed by an in-context observational study that examined these individuals context of use. The study identified the OSNs and assistive technology used, tasks carried out and users feelings during interaction. As a result of these studies it was determined that changing OSNs prevented and or slowed down these users ability to communicate online.

Previous work within human-computer interaction and other disciplines such as software engineering

and management science, change is often discussed during software development and is restricted to identifying scenarios and tools that assist change management within information technology (Jarke and Kurkisuonio, 1998). Studies such as these have not considered change deployment or its affect on users, though within HCI such an understanding is limited.

Other disciplines i.e. psychology and social sciences have looked at change deployment. Theorists such as Lewin (1952), Lippett (1958) and Griffith (2001) attempt to offer solutions. However no one theory or approach is widely accepted and contradictions, adaptations and exclusions are continually being made. Conversely Woodward and Hendry (2004) and By (2007) have attempted to contend with these difficulties specifically stress as a result of change, believing that if change agents are aware of what an affected individual is thinking during the on set of change it will help to minimise or prevent damage. Studies such as these have focused on software development or organisational change from the perspective of developers or employees, they have not considered OSNs or individuals with cp.

To fill this gap a longitudinal OSN monitoring and analysis study was carried out. The study identified how OSN changes are introduced, their affect on users, and the factors that encourage change acceptance or non-acceptance. The study was divided into three studies: two studies investigating real-world examples of OSN change by observing the actions of change agents (Twitter.com and Facebook.com) and their users reactions to the change process. A third study that asked OSN users about their experiences of OSN change was also carried out.

A by product of these studies was a unique way of displaying OSN change and user acceptance on a large scale using a infographic and an inductive category model that can be used to examine OSN change. The findings from the five studies were then distilled alongside identified change management approaches and theories to develop an five-stage process for OSN change for change agents to follow. The process defined the requirements for OSN change including the change agent responsibilities before, during and after the change.

Keywords: Online Social Networks, OSN, Cerebral Palsy, cp, Change, Change Management, Twitter, Facebook, Process, Five-Stage Process for OSN Change.

Glossary of Terms

- **OSN** - Online social networks also referred to as social networking websites or social media, are a type of computer-mediated communication (CMC) that allow to: construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, view and navigate their list of connections and those made by others within the system (Boyd, 2007). For example Facebook, Twitter, MySpace, and Bebo.
- **Cp** - Cerebral palsy is a group of disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing foetal or infant brain, The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and or by seizure disorder (Bax et al 2005).
- **HCI** - Human-computer interaction involves the study, planning, and design of the interaction between people (users) and computers (Rathi et al 2012)
- **UX** - User experience is a term for a user's overall satisfaction level when using your product or system (FatDUX Group ApS, 2006).
- **CMC** - Computer-mediated communication systems is as any communicative transaction that occurs through the use of two or more networked computers (Yu, 2011).
- **a11y** - Computer accessibility (also known as Accessible computing) refers to the accessibility of a computer system to all people, regardless of disability or severity of impairment. It is largely a software concern; when software, hardware, or a combination of hardware and software, is used to enable use of a computer by a person with a disability or impairment, this is known as assistive technology (AT) (Venkateswarlu et al 2012).

Chapter 1 – Introduction

1.1. Introduction

In 2011, 77% (19.2 million) of households in the United Kingdom (UK) had access to the Internet, an increase of 5 million since 2006 (Office of National Statistics, 2011). Online social networking has proved to be the most popular Internet activity (Office of National Statistics, 2011). 49% of these users have updated or created an online social network profile and are making over 24 million visits a month (Dutton, 2009). Online social network use is most prevalent among 16 to 24 year olds with 91% having used an online social network such as Facebook and Twitter (Office of National Statistics, 2011). Online social networks are also being used by individuals aged 25 to 34 years old (Ofcom, 2009) though they are more likely to participate in professional online social networks such as LinkedIn (Office of National Statistics, 2011). Additionally older Internet users, those aged 65 years old and above are also participating in online social networking (18%) (Office of National Statistics, 2011). Other popular online social networks include MySpace, Bebo and YouTube (AbilityNet, 2008).

These websites are often directed at a broad market i.e. people without disabilities. Unfortunately people with disabilities especially those with physical impairments often have a greater risk of experiencing loneliness than people without a disability as a result of their mobility, access and or communication impairment (Braithwaite et al, 1999). Conventional communication methods such as face-to-face communication, telephone communication and text message communication are often difficult to use and can limit the opportunities for people with disabilities to engage in successful socialisation with family members and friends (Braithwaite et al, 1999). Therefore people with disabilities can often see online communication, especially online social networks, as an attractive alternative. However, due to inaccessible features present in the technology for example features requiring JavaScript, hard-coded text size and Captcha (AbilityNet, 2008; Cahill and Hollier, 2009 and Asuncion, 2010) access to online social networks is often difficult.

The overarching purpose of this PhD research is to understand the experiences and challenges faced when people with the physical disability cerebral palsy use online social networks.

1.2. Motivation for research

I have observed individuals with cerebral palsy become more physically integrated into the community but not truly part of that community. This has been echoed in Ballin and Balandin (2007) who suggest that adults with life-long disabilities including those with cerebral palsy experience communicative isolation and depression as a result of their impairments. I have observed as my parents, who both have cerebral palsy, sat on the sidelines of the communicative world due to their mobility restrictions and their use of alternative and augmented communication (AAC) devices for example wheelchairs, talkers and computer screen readers. I believe that recent innovations in computer-mediated communication (CMC) specifically online social networks such as Facebook and Twitter could offer my parents entry into the communicative world effortlessly and independently. However this technology is flawed and often presents barriers (AbilityNet, 2008; Cahill and Hollier, 2009 andAsuncion, 2010).

This PhD research aims to understand the key inhibiting factors and offer a process that will enable my parents to be better included.

1.3. Problem statement

1.3.1. Cerebral palsy community

It is estimated that 1 in 400 children born in the UK is affected by cerebral palsy (cp) (Scope Response, 2007). According to Bax (2005) cp is a "group of disorders of the development of movement and posture, causing activity limitation, that are attributed to non progressive disturbances that occurred in the developing infant brain, The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and or by seizure disorder".

The disability (which is defined as a person whom has a physical or mental impairment that as has a substantial and long-term adverse effect on his or her ability to carry out normal day-to-day activities (Office for Disability Issues, 2010)) can present itself in a variety of ways and to varying degrees. In some individuals it may be barely noticeable, whilst in others support may be required to carry out daily tasks such as eating, walking and talking (Mayston, 2001). There is no cure for cp however

management to increase social interaction especially through technological innovations is often encouraged (United Cerebral Palsy, 2001; Sharan, 2005 and Colledge, 2006).

Human-computer interaction (HCI) literature such as Braithwaite et al (1999), Ellis and Kent (2010) and Dobransky and Hargittai (2006) suggests that online social networks specialised (for example DisabledUnited) and mainstream (for example Facebook) are opening a new world to individuals with disability. They help these individuals especially those exhibiting lifelong physical challenges including those with cp to overcome their mobility, access and or communication limitations, so as to carry out social interaction which they would otherwise not be able to do within the analogue world.

The cp community was chosen because it is believed that they are under represented within this literature.

1.3.2. Online social networks

Previous studies such as AbilityNet (2008), Cahill and Hollier (2009) and Boudreau (2011) have explored mainstream online social networks use from the perspective of users with disabilities such as blind and visually or cognitively impaired but have investigated website inaccessibility without involving these users. Other studies such as Manna (2005) and Belchiorb et al (2005) have used statistical methods, such as surveys and questionnaires to identify Internet use among people with unspecified disabilities. Conversely Asuncion(2010) has taken a broader approach involving online social network users using high-level taxonomies to classify their disabilities.

Similarly Marshall et al (2006) focused on a specific disability type (cognitive impairments) without considering the variety of limitations present within the disability. Generally these studies focus on blind or visually impaired users and marginally on those with cognitive impairments meaning that there is no clear understanding of the requirements for users with physical disabilities especially those with cerebral palsy.

Other studies, such as Pell (1999), have taken a broader yet more specific approach and looked at technology use, especially computer and assistive technology among people with physical disabilities

where only 7 out of 82 surveyed had cerebral palsy. Whereas Braithwaite et al (1999) focused on individuals with disabilities, where most were classified as having a physical disability. However this study does not explicitly look at online social networks but rather at online social support within forums for people with disabilities. Studies such as these have not involved the users; defined what constitutes disability or focused on cerebral palsy without encompassing other disabilities, making it impossible to identify the requirements of online social network users with cp.

The aim of this PhD research is to address this gap in the research to make this community visible.

1.3.3. A journey to change

Initially this PhD research explored the experiences and challenges faced when individuals with cp use online social networks. Fourteen interviews were carried out consisting of participants with variations of the disability (see chapter 3). The study identified the reasons for online social network use and non-use and also discovered key themes together with challenges that affected their experiences. This was followed by an in-context observational study (see chapter 4) that examined their context of use. The study identified the online social networks and assistive technology used, tasks carried out and users feelings during interaction.

As a result of these studies it was determined that changing online social networks prevented and or slowed down these individuals ability to communicate online. Such online social network changes are common for example during September 2011 Facebook introduced three functional changes that included revamped friend lists, a real-time news ticker and a subscribe button . During the following month further changes that included an overhaul of user profiles, new applications for playing music and watching videos were also deployed (Parr, 2011).

1.3.4. Change

Within HCI and other disciplines such as software engineering and management science change is often discussed during software development and is restricted to identifying scenarios and tools that assist change management within information technology (Jarke and Kurkisuonio, 1998). For example

Kowalczykiewicz and Weiss (2002) developed software that notified software developers of changes within a unified development platform. The work identified how it effects other parts of the software development and how uncontrolled changes can cause project destabilisation. However studies such as this have not considered how change is introduced or its affect on users. In HCI this understanding is limited. Thus researchers and practitioners within software engineering have put forward A/B testing that considers two versions of an element and a metric that defines success.

Other disciplines i.e. psychology and social sciences have also looked at change deployment, theorists such as Lewin (1952), Lippett (1958) and Griffith (2001) attempt to offer solutions. However no one theory or approach is widely accepted and contradictions, adaptations and exclusions are continually being made. Additionally these theorists do not consider users acceptance of the change or the approach used.

Conversely Woodward and Hendry (2004) and By (2007) have attempted to contend with these difficulties specifically stress as a result of change believing that if change agents are aware of what an affected individual is thinking during the onset of change it will help to minimise or prevent damage. Studies such as these have offered frameworks for the affected individuals to follow however they have not offered guidance for organisations nor have they considered the type of change or the approaches being used.

As a result most organisations and theorists are highly skeptical of new (or amended) change methods and approaches, because they believe an unbreakable cycle is in motion i.e. “change efforts is made, it runs into trouble, it gets reviewed, and the conclusion is drawn that change should have been managed better” (Griffith, 2001).

Currently change research focuses on software development or organisational change from the perspective of developers or employees, it does not consider the use of online social networks. The aim of this PhD research is to address this gap in the research by investigating change in active online social networks, its impact on users and proposing a process for effective change deployment whilst also limiting the affects of such change on users with cp.

1.4. Research questions

The goal of this PhD research is to address the gap in HCI literature (as discussed in section 1.3) by providing an understanding of the experiences and challenges faced when people with cp use online social networks. It will also investigate change deployment in online social networks and put forward a process for online social network change that change agents can follow whilst also limiting the affects of such change on users with cp.

As a result five research questions have been identified:

1. What is the current situation of online social network use among adults with cerebral palsy?
2. What are the key inhibiting factors that prevent and or slow online social network use among adults with cerebral palsy?
3. How are online social networks deploying change?
4. How are online social network users experiencing and accepting change?
5. How can online social networks change deployment approach be improved to better facilitate users with cerebral palsy?

1.5. Summary of studies

To answer the five research questions (see chapter 1 section 1.4) five qualitative studies were carried out. The first study, an exploratory interview study (see chapter 3), identified the reasons for use and non-use of online social networks by people with cp and also key themes including independence, privacy, trust, and change, together with challenges such as slow input speed, poor user interface features, lengthy and complicated tasks, lack of user interface personalisation and unavailable or inappropriate within-website help. Due to the method used some participants especially those with natural speech impairments or those who used augmented and alternative communication technology could not fully describe their technology use without assistance from their support individual.

This resulted in an in-context observational study (see chapter 4). The study identified the online social networks and assistive technology used, tasks carried out and users feelings during interaction.

It was determined that changing online social networks prevented and or slow these users ability to communicate online which has not been represented within HCI literature (see section 3).

To further explore this a longitudinal online social network monitoring and analysis study was carried out. The study identified how online social network changes are introduced, their effect on users, and the factors that encourage change acceptance and non-acceptance. The study was divided into three studies: two studies investigating real-world examples of online social network change by observing the actions of change agents (Twitter and Facebook) and users reactions (see chapter 5 and 6). These real-world examples were chosen because these service providers deployed change during the length of this PhD research. A third study that asked online social network users about their experiences of web change was also carried out (see chapter 7).

The five studies were used alongside recognised change management literature (see chapter 2) to develop an innovative five-stage process for online social network change for change agents to follow (see chapter 8). The process defined the requirements for successful online social network change including the change agent responsibilities before, during and after the change.

1.6. Contribution to the field

It is believed that this PhD research will offer multiple contributions that will bridge the gap in previous HCI literature by providing an understanding of the experiences and challenges faced when people with cp use online social networks and to put forward a process for online social network change that change agents can follow whilst also limiting the affects of such change on users with cp. The contributions include an insight and understanding of:

1. How individuals with cp use (would like to use) online social networks. This was identified within the exploratory interview study (see chapter 3),
2. Real world examples of how and where individuals with cp use online social networks. This was identified within the in-context observational study (see chapter 4),
3. Current online social network change processes and user acceptance and non-acceptance. This

was identified within the longitudinal online social network monitoring and analysis study of real-world online social networks (Facebook and Twitter) followed by a questionnaire (see chapters 5, 6 and 7),

4. Unique way of displaying online social network change and user acceptance on a large scale using an infographic. This was expressed in the first longitudinal online social networks monitoring and analysis study that explored the Twitter change deployment process (see chapter 5),
5. Inductive category model that examines online social network change. The category model was initially developed during the first online social network monitoring and analysis study (see chapter 5). It was then used to examine change acceptance within another mainstream online social network (Facebook) (see chapter 6),
6. A five-stage process for online social network change for change agents to follow (see chapter 8). This was developed by distilling the five studies (see chapters 3 to 7) alongside identified change literature (see chapter 2).

Lastly, this PhD research will offer useful information for online social network providers; specifically their change agents, and HCI, and to a lesser extent web accessibility and computer-mediated communication researchers, academics and practitioners.

Chapter 2 – Literature review

2.1 Introduction

This chapter is divided into two areas: factual and theory. It starts by factually discussing online social networks emphasising their global popularity and use levels, and how they will be covered in this PhD research. It will then provide demographic data relating to cerebral palsy answering: what is disability, what is cp, what are its causes and prevalence, how can it be managed, and what assistive technologies are being used to access computers and the Internet.

The chapter then considers the theory behind this PhD research starting with the participation of people with disabilities in online social networks, highlighting recent qualitative and quantitative studies. These studies are then compared to online social network participation among people with cerebral palsy. The chapter will then provide insight into change, answering: what is change, what are the most accepted theories, types of deployment, acceptance and non-acceptance amongst individuals experiencing change.

It will end by discussing the overarching inductive methodology used throughout this PhD research.

2.2 Factual: Online social networks

2.2.1 Definition

Online social networks (OSN), also referred to as social networking websites or social media, are a type of computer-mediated communication (CMC). According to Boyd (2007) OSNs are web-based technology that allow individuals to:

- Construct a public or semi-public profile within a bounded system,
- Articulate a list of other users with whom they share a connection,
- View and navigate their list of connections and those made by others within the system.

More recently OSNs have been described as a form of CMC that:

"Offer people new and varied ways to communicate via the Internet whether through their PC or their mobile phone. They allow people to easily and simply create their own page or profile and to construct and display an online network of contacts, often called 'friends'. Users of these sites can communicate via their profile both with their 'friends' and people outside their list of contacts. This can be on a one-to-one basis (much like email), or in a more public way such as comments posted for all to see" (Office of Communication, 2008:5).

2.2.2 Understanding online social networks

2.2.2.1 Purpose

OSNs allow users to network, look for and meet new people. Though this need to network is often not the primary purpose of their use (Boyd, 2007) users also communicate with people who are already a part of their extended offline social network. As a result, OSNs are distinguishable from other types of CMC such as forums, chat rooms and bulletin boards . Boyd (2007) and Office of Communication (2008) suggest that the uniqueness of OSNs is not that they allow users to meet strangers but rather they enable users to articulate and make visible their social networks which can result in friendships between people that would not otherwise be made.

2.2.2.2 Creating a profile or page

OSNs consist of profiles (pages) that present an articulated friend list. These friends are also members of the OSN and their profiles can also be viewed by their friends (Boyd, 2007 and Office of Communications, 2008). Profiles are based on a set of criteria: age, location, interests (see figure 1). Often OSNs encourage users to enhance their profiles by adding photographs, personalisation elements, multimedia and applications for example music (see figure 1), and poking (see figure 2) (Boyd, 2007).

Figure 1. Example of OSN profiles: a) Facebook, b) Twitter and c) MySpace (copyright has been granted)

The visibility of profiles can also vary, however this is usually controlled by users. Users can opt to have parts of their profile viewable the public including non-OSN users, their friends or friends of friends. However each OSN differs in how it lets users control their visibility. According to Boyd (2007) "these structural variations in visibility and access are one of the primary ways that [OSN] differentiate themselves from each other".

Figure 2. 'Super Poke' application on a Facebook users profile (copyright has been granted)

2.2.2.3 Using online social networks

OSN users are regularly prompted to identify others within the OSN with whom they would like to have a relationship or already have a friendship with (Boyd, 2007). This action is referred to as a friend request. Once a friendship is made users can view each others' friend list and request new friends. According to Facebook Press Room (2010) the average Facebook user sends 8 friend requests per month. Users are also able to communicate with each other through private messages and public comments (see figure 3). Additionally the average Facebook user writes 25 comments per month. Users can also send photos, videos, blogs and instant messages. However these features vary among OSNs (Boyd, 2007 and Office of Communications, 2008).

Figure 3. Facebook profile illustrating comments (copyright has been granted)

2.2.2.4 Users

In 2011, 77% (19.2 million) households in the UK had access to the Internet, an increase of 5 million since 2006 . OSNs have proved to be the most popular Internet activity (Office of National Statistics, 2011). 49% of these users have updated or created an OSN profile (Dutton, 2009). OSNs use is most

prevalent among 16 to 24 year olds, with 91% having used an OSN such as Facebook and Twitter . OSNs are also being used by older generations. 78% of individuals aged 25 to 35 years old use OSNs, though they are more likely to participate in professional networks such as LinkedIn . Furthermore 18% of individuals over 65 years old are carrying out use (Office of National Statistics, 2011). Consequently these users consist of five types:

- Alpha socialisers (representing the majority), users who use websites in intense short bursts to flirt, meet new people, and be entertained,
- Attention seekers (representing some), users who crave attention and comments from others often by posting photos and customising their profiles,
- Followers (representing many), users who join websites to keep up with what their peers are doing,
- Faithfuls (representing many), users who typically use OSNs to rekindle old friends, often from school or university,
- Functionals (representing the minority), users who tend to be single-minded in their use of OSNs, usually for a specific purpose (Office of National Statistics, 2008).

2.2.2.5 Growth

The first OSN was SixDegrees which appeared in 1997 (Boyd, 2007). However the most recognised were FriendsReunited which launched in 2000 and Friendster which launched in 2002 (Office of Communications, 2008). Soon after there was a surge in OSNs . In 2010 the most popular OSNs were Facebook which launched in 2004 and had 400+ million users (Facebook Press Room, 2010); MySpace, which launched in 2003 and had 110+ million users (Siwa, 2008); Twitter, which launched in 2006 and had 106 million users (Twitter Press, 2011); and Bebo, which launched in 2005 and had 80+ million users (Garfield, 2006).

Furthermore niche OSNs have also gained popularity such as LinkedIn which launched in 2003 and has 50+ million professional users (Weiner, 2009). This rapid growth indicates that OSNs are now a

mainstream form of CMC for many individuals . According to Office of Communications (2008 and 2011) there are five factors that have enabled this growth:

- Increase in Internet home penetration, 77% of all adults in the UK have an Internet connection at home,
- Increase in ICT confidence, increasing number of individuals who have obtained basic ICT knowledge and experience,
- More user friendly and basic programmes that involve simple form filling and drop down boxes
- Communication is no longer task based or information sharing. Communication is now based on creating and maintaining social connections,
- OSNs are not restricted to messaging, communicating and displaying social networks. Users can also post videos, music, photographs and blogs to their profiles and share them with their connections.

2.3 Factual: cerebral palsy

2.3.1 Definition

According to the Office for Disability Issues (2010) disability is defined as a person whom has a physical or mental impairment and the impairment has a substantial and long-term adverse effect on his or her ability to carry out normal day-to-day activities. As a result cerebral palsy is considered to be a disability, according to Clegg and Mary (1988) cerebral palsy (cp) is a "a persistent but not unchanging disorder of movement and posture, as the result of one or more non-progressive abnormalities in the brain, before its growth and development are complete".

More recently it has been defined as:

> "a group of disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing foetal or infant brain, The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and or by seizure disorder" (Bax et al, 2005).

Essentially cp is an umbrella term that defines a group of non-progressing neurological disorders that effects movement, posture, and muscle co-ordination (Mayston, 2001). It is a physical (also referred to as motor) impairment that reduces the ability of an individual to control their motor function. Cp is a life long disability that is neither a disease or communicable (Scope Response, 2007).

2.3.2 Understanding cerebral palsy

2.3.2.1 Cause

Cp is caused by a brain defect or lesion that occurs before cerebral development is complete (Mayston, 2001; Krigger, 2006 and Scope Response, 2007) i.e. the brain has been injured or fails to develop (United Cerebral Palsy, 2001). In 80+/-% of cases the disorder occurs during prenatal periods (Krigger, 2006), specifically premature births between 20 to 30 gestational weeks (Mayston, 2001).

Suvanand et al (1997) cited in United Cerebral Palsy (2001) and Scope Response (2007) identified five risk factors that can increase the chance of its occurrence:

- Mother's age is over 40 or under 20,
- Infant is one of twins particularly if one twin dies,
- Infant of low birth weight,
- Bacterial infection of the mother,
- Prolonged loss of oxygen during birthing process.

However in most instances it is not possible to identify why the condition has occurred (Scope Response, 2007).

2.3.2.2 Incidence and prevalence

One in every 400 infants born within the UK has cp, approximately 1,800 infants each year (Scope Response, 2007). In the United States approximately 1.5 to 2 million individuals have the condition and this equates to 11,200 to 11,500 infants born each year (United Cerebral Palsy, 2001). Globally it is estimated that 15 million individuals are affected (The Centre for Cerebral Palsy, 2010 and Colledge, 2006).

2.3.2.3 Manifestations

Cp can be seen at or around the time of birth or it can become apparent in early childhood (Scope Response, 2007). It is a wide-ranging disability that can manifest in different ways and to varying degrees depending on the size, location and timing of the lesion (Mayston, 2001). This means no two individuals are affected in the same way. For example impairments may be barely noticeable in one individual but in another support may be required to complete basic everyday tasks (Scope Response, 2007).

According to Scrutton (1984) the "variety [and the lack of common language to describe this variety accurately (Scope Response, 2007)] makes learning about it very difficult indeed". Nevertheless cp is classified based on the type of neuromuscular deficit (Singhi, 2004). There are four classifications:

1. spastic (spasticity) - where the brain defect or lesion is located within the cortex (Stanton, 1997) (see figure 7). 80+/-% of individuals are affected by this form of cp (Krigger, 2006). People with spasticity exhibit increased deep tendon reflexes, tremors, muscular hypertonicity, weakness, loss of selective movement, loss of postural control (Mayston, 2001) and have a characteristic 'scissors gait' with toe-walking movement (Scope Response, 2001).

2. athetoid or dyskinetic (athetosis) - where the brain defect or lesion is located within the basal ganglia (Stanton, 1997) (see figure 8) and affects 10 to 20% of individuals (Krigger, 2006). People with athetosis exhibit involuntary and uncontrollable abnormally slow, writhing movements of hands, feet, arms, or legs. These movements can become more apparent when excited or stressed (Krigger, 2006 andScope, 2007). Their speech is often hard to understand as they may have difficultly controlling their tongue, breathing and vocal cords. This often means they can have difficulty eating and they may drool (Scope Response, 2007).

3. ataxic (ataxia) - where the brain defect or lesion is located in the cerebellum (Stanton, 1997) (see figure 7) and affects 10+/-% of individuals. Individuals with ataxia exhibit spatial awareness, balance and coordination difficulties (Mayston, 2001 and Scope Response, 2007). They may also have shaky hand movements and irregular speech. In most instances these individuals can walk effectively but usually appear unsteady (Scope Response, 2007).

4. mixed type -used for individuals that do not fit into the above classifications (Stanton, 1997) where a combination of impairments is exhibited. For example "a child with spastic diplegia will have mostly spastic muscle difficulties, with the legs affected more than other parts of the body. However the child might also have some athetosis and balance problems" (Scope Response, 2007).

Cp can be further categorised by referring to the limbs that are affected . There are six categories: diplegia, which primarily affects the lower limbs more than the upper limbs, hemiplegia, which affects one side of the body, quadriplegia, which affects all limbs; and more rarely, triplegia, which affects three limbs, monopelgia, which affects one upper limb, paraplegia where only one lower limb is affected (Mayston, 2001; United Cerebral Palsy, 2001; Scope Response, 2007 and Stanton, 1997).

Due to the neurological nature of cp associated difficulties and medical conditions can also be observed. For example sensory and perceptual difficulties, cognitive impairments (most individuals have average to higher intelligence), epilepsy, pain and incontinence (Scope Response, 2007 and Mayston, 2001).

2.3.2.4 Management

Cp cannot be cured but management is often provided . The term ‘management’ is used instead of ‘treatment’ as it refers to reducing and or preventing secondary impairments or conditions (Sharan, 2005) and aims to help an individual achieve maximum potential in terms of growth and development (United Cerebral Palsy, 2001 and Colledge, 2006).

Further to this Krigger (2006) suggested the “goal of management of [cp] is not to cure or to achieve normalcy but to increase functionality, improve capabilities, and sustain health in terms of locomotion, cognitive development, social interaction, and independence”. This is often achieved through training and help, for example:

- Physical therapy to prevent muscle weakness and stiffness,
- Occupational therapy to improve posture and carry out everyday tasks,
- Speech and language therapy to improve natural speech clarity or to provide alternative and augmentative devices,
- Orthotics and splints to compensate for muscle imbalances (see figure 9) to aid independent mobility Medication to relax muscle spasms, alleviate pain or to control secondary impairments or conditions,
- Muscle relaxant injections for example Botulinum Toxin, to reduce spasticity in the short term; surgery to correct anatomical abnormalities or to release tight muscles,
- Assistive technology such as mobility devices and daily living aids for example environmental control systems and grab sticks (Colledge, 2006 and National Institute of Neurological Disorders and Stroke, 2009).

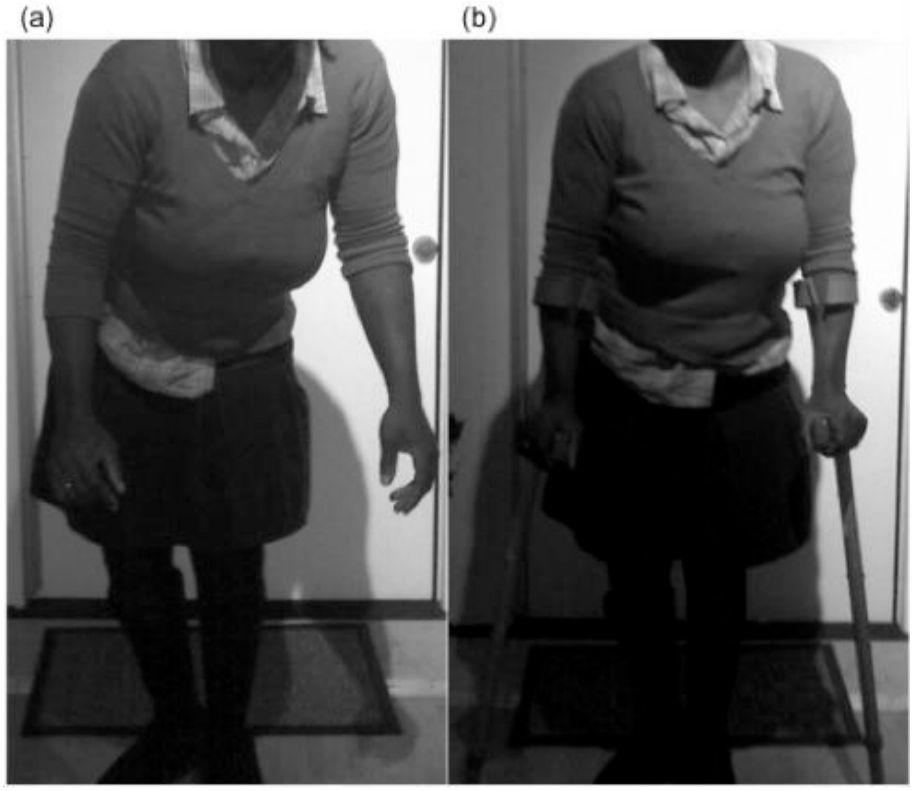


Figure 4. Individual with diplegia cp (a) without orthotics and splints and adaptive equipment (b) with orthotics and splints and adaptive equipment to support posture and movement (Lewis, 2012) (Copyright has been granted).

2.4 Role of assistive technology

Assistive technology can play a valuable role in the lives of people with cp as it offers management opportunities specifically of interest here improving computer use and social interaction. However there are many other opportunities.

2.4.1 Definition

According to Disability Solutions (1998:1) assistive technology (AT) is:

> "Anything that can help a person with a disability do something s/he cannot do or help do it better than s/he can without the device … an extension on a light switch that allows a child in a wheelchair to turn on the light. It is a sound system that makes it easier to hear what the teacher is saying. It is a pencil grip that helps a child better grasp a pencil. It is software that does something special such as speak the words printed on the screen for someone who cannot read the print. It is a clipboard that holds down a piece of paper that helps a child write more legibly. It is thousands of items that help individuals with all sorts of disabilities and challenges … the only thing assistive technology cannot do is help a person to do something that s/he is not developmentally or cognitively ready to do".

This definition is further echoed by the World Health Organisation (2004) which states that AT devices are "an umbrella term for any device or system that allows individuals to perform tasks they would otherwise be unable to do or increases the ease and safety with which tasks can be performed". AT devices can take many forms and is designed to compensate for or enhance the function of a physical ability that is impaired (Alisa, date unknown) and aids independence amongst its users.

2.4.2 Occurrence

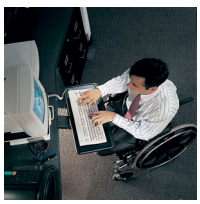
The number of AT devices available for people with cp is astounding. The AbleData database has more than 36,000 entries (AbleData, 2010) and new products are being launched every day (Disability Solutions, 1998). For this reason identifying all possible AT devices that can be used by people with cp would be impractical due to the sizeable number available and the varying manifestations of the

disability. For example one individual may not require AT devices whilst another may require low-tech AT devices for example . keyboard guards, another requiring medium-tech for example computer screen readers or another requiring high-tech AT devices for example . augmented and alternative technology. For this reason a focus on the most common computer-based AT devices used by the cp community will be discussed.

2.4.3 Computer-based assistive devices

According to Brown (1992:32) a “mechanical prosthesis (orthotics and splints) becomes a natural extension of a person compensating for a limb lost to accident or injury. Similarly, a computer adaption quickly becomes an extension of its user, an electronic prosthesis effortlessly compensating for and restoring his/her ability to use a computer”.

In 1992 QWERTY keyboards, mice and monitors were the primary channels for interacting with computers. People with CP often find these channels difficult or impossible to operate (Brown, 1992). Their reduced fine motor skills mean that keyboard position, access and text entry can become critical issues (Brown, 1992) and as a result keyboard supports, virtual keyboards, large-print keyboards, keyboard guards, covers or overlays, one-handed keyboards, sticky, mouse or slow keys, word prediction programs and spell check, correction and speech recognition programs are often used (see table 1 for examples).



(AbleData, 2010)

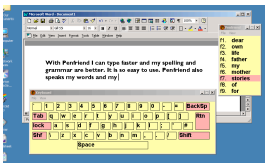
(AbleData, 2009)

DESCRIPTION	EXAMPLE
Keyboard support Keyboard tray support arm that is designed for use for wheelchair accessible computer workstations (AbleData, 2010).	Advantage Arm Keyboard Support Mechanism.
Large print keyboards Keyboards with oversized keys that are sometimes colour-coded to teach by character (AbleData, 2009).	Kinderboard

Keyboard guards A coated steel or plastic frame that fits securely over a keyboard to provide a physical separation (barrier) between each key (AbleData, 2009).	Key-guards KB
Keyboard cover Provides a surface for placement of a switch, so the user can operate a laptop without distraction or interference from the keyboard (AbleData, 2010).	Model H-20 Laptop Keyboard Cover
Virtual Keyboard On-screen keyboard that enables the user to send keystrokes to applications using a mouse, trackball, touch screen, or other pointing device (AbleData, 2009).	Click-N-Type Virtual Keyboard
One-handed keyboards Also referred to as a half-QWERTY keyboard allow one-handed typing (AbleData, 2003).	Maltron 3D one hand keyboard left – KM - LH
Sticky keys, mouse and slow keys Allows the user to modify the operation of the keyboard and mouse. For example: StickyKeys alter the "modifier" keys for example SHIFT can be pressed before the key they modify, rather than at the same time; MouseKeys allow the keys on the numeric keypad to be used in place of the mouse; and SlowKeys enables a keyboard delay (AbleData, 2003).	Easy Access
Word prediction programs Provides the user with smart lists for example when typing the word "lucky", by selecting the letter "L", the "L" key opens up showing a list of options including the "root" letter plus any possible extensions. Instead of the next letters being scattered around the keyboard, the likely letters are organised in a list, showing what has already been typed as well as possible subsequent letters (AbleData, date unknown).	Reach with Smart Lists v.4
Spell check and correction programs Supplements spell checkers. The checking mechanism provides suggestions based on phonetic similarity to an entered word, so the correct word can be produced from even complex misspellings. Searches can also be conducted on the beginning or the end of words, according to user preference (AbleData, 2007).	KeySpell Ellipsis

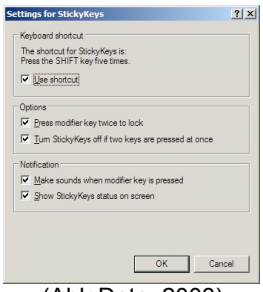
(AbleData, 2009)

(AbleData, 2010)

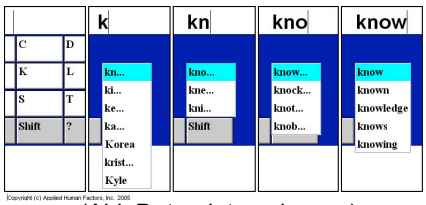


(AbleData, 2009)

(AbleData, 2003)

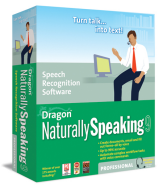


(AbleData, 2003)



(AbleData, date unknown)

(AbleData, 2007)



(AbleData, 2008)

Speech recognition programs Enable hands-free operation of computers and allows users to speak at their normal pace (AbleData, 2008).	Dragon Naturally Speaking

Table 1. Examples of assistive technology that enhance keyboard efficiency for users with cp. These users may use none, one or more of these technologies.

Furthermore individuals exhibiting ataxia will typically have a tougher time operating a mouse or track-pad due to jerky and unpredictable upper limb movements (WebAIM, 2010) (see chapter 2 section 2.3.2.3). Alternative mice such as trackballs and joysticks can be effective. However for those exhibiting athetosis such measures are often ineffective due to increased upper limb movements (see chapter 2 section 2.3.2.3). In these instances switches, head operated pointing tools, mouse emulator programs and eye-controlled entry systems are often appropriate (see table 2 for examples).


(AbleData, 2009)


(AbleData, 2008)


(AbleData, 2009)

DESCRIPTION	EXAMPLE
Switch Uses one or more switches to select from an electronic (set) of graphic images, symbols, and/or alphanumeric characters. The user only needs to have consistent control of one or more anatomical sites, for example eyebrow or foot, for accessing a single switch, or multiple switches (AbleData, 2009).	Head switch Model 705 that can be used with the Win Scan program
Head-controlled mouse A micro-gyroscope senses the user's head movements, transmits the movements to the computer using radio frequency (RF) waves (AbleData, 2008).	Boast Tracer
Eye-controlled input system Enables the user to control the mouse by looking at a screen and dwelling (staring at the screen for a certain length of time) to select and blinking to click (AbleData, 2009).	Ceye eye control module

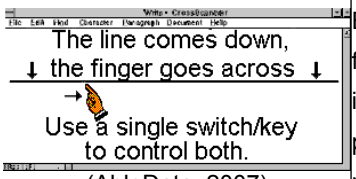
 (AbleData, 2009)	**Trackball** The centre of the device is a ball that can be moved with the palm of the hand or the fingertips to control the cursor. On both sides of the ball are large buttons, allowing users to perform the "left" and "right" clicks of a standard mouse (AbleData, 2009).	Expert mouse model K64325
 (AbleData, 2007)	**Mouse emulator program** Enables one-switch or two-switch control of mouse functions. With the switches plugged into a switch interface, the user is able to perform mouse moves; performs clicks, double clicks, and drags; operate menus; and enter text through an on-screen keyboard (AbleData, 2007).	CrossScanner
 (AbleData, 2009)	**Joystick** Enables a user to rests a hand passively over a teardrop shaped joystick handle for mouse pointer control. The devices usually have 3 large built-in buttons for left, right, and middle (drag) clicking (AbleData, 2009).	Gimpgear ultra-precision USB joystick mouse and PC game controller

Table 2. Examples of assistive technology that enhance keyboard efficiency for users with cp. These users may use none, one or more of these technologies.

The keyboard and mouse are not the only barriers for effective computer operation. Individuals with cp can also have problems looking at monitors due to limited head control. In these instances, computer screen reading programs are used to provide visual information by translating it to an audio format (AbleData, 2007). However successful computer operation is not always dependent on AT devices that are within or attached to the computer. They can be accommodations to the context of use. For example, an adjustable design and ergonomically designed workstation including arm supports, page-turners and book holders can ensure efficient computer use (BC Society of Training and Health and Employment Opportunities, 2008).

2.4.4 Augmented and alternative communication technology

Individuals with cp especially those exhibiting ataxia often have a communication impairment. Augmented and alternative communication (AAC) devices can assist these individuals to communicate in addition to or instead of their natural speech (Lal, 2009; Horner et al, 2009 and Centre for Cerebral Palsy, 2010). There are two types of AAC devices available for individuals with cp:

1. Aided*,* referring to external equipment assisting users to output communication. For example manual communication boards or electronic speech synthesisers or recorded human voices (Ofcom, 2009; Horner et al, 2009 and Alisa, date unknown),
2. Unaided**,** referring to techniques that can be produced by a users body. For example signs, gestures and facial expressions (Odom, 2009). In most instances a combination of the above techniques are used (Horner et al, 2009).

AAC devices are not confined to speech communication but can also act as 'integrated' speech emulators for example Liberator-14 . They allow individuals with communication impairments, specifically amongst individuals with cp, to use a talker to engage in communication face-to-face whilst also use OSNs without chopping and changing between equipment (Guidera, 2008).

2.5 Theory: participation in online social networks

According to Graene Innes (2009) cited in Ellis and Kent (2010) OSNs are opening a new world to individuals with disability and in the future individuals not using them (including those without disability) would effectively be disabled, as they will not have access to vital information or ways to communicate. This is because OSNs provide a novel solution to inaccessible built environments and impairment effects, such as physical, cognitive, visual and hearing impaired, which can prevent individuals with disabilities from networking and socialising in the analogue world (Ellis and Kent, 2010; Mullolland, 2009 and Seymour and Lupton, 2004).

According to Ballin and Balandin (2007) researchers have argued that these individuals are now appearing more physically integrated in their community however they are often not truly part of that community. This is because their disability can affect multiple aspects of their life: behavioural, economic and social, which often results in isolation from the community (Briathwaite, 1996 cited in Braithwaite et al, 1999; McKenna et al, 2002 and Marshall et al, 2006). Individuals with a disability often experience a higher level of depression, loneliness and alienation (Shworles, 1983 cited in Glicken (2009), and Zastrow, 1986 cited in Ellis and Kent (2010)). Such an understanding is linked to limitations in mobility, communication and socialisation skills . For example an individual may have significant difficulty moving around or travelling from place to place. Thus leaving home to interact with others may be prohibitive .

Furthermore they may also find access to both disabled and non-disabled individuals restricted due to a partial or complete loss of the ability to communicate using their natural speech or use of AAC devices (Braithwaite et al, 1999). This means conventional face-to-face communication can be difficult due to insufficient time or confidence to communicate . Conversely telephone communication can be very efficient but there are instances where this can be difficult or impossible to use, again due to communication impairments that often make communication time consuming and hard for the receiver to understand (Ballin and Balandin, 2007: 320). One of the interview participants from the study reported:

"Interviewer: And how do you find using the telephone to communicate with others?,

Michael: if people take the time,

Interviewer: so talking on the phone, time can be a factor. Is that correct?

Michael: yes".

As a result the interactional world of individuals with severe disabilities is often restricted to close family members and paid support workers. Such interaction is often obligation, dependency, competing priorities and exhaustion related (Seymour and Lupton, 2004). Thus, online communication exposes "people with disabilities to the world of strangers. The computer opens the door to a world of new ideas and values. It heightens the possibility that disabled people will come into contact with people who do not share their view of the world and the communication will take place in a context that is not dominated by their 'tragedy'" (Seymour and Lupton, 2004).

Therefore rendering OSNs highly attractive (Braithwaite, et al, 1999). Individuals with disabilities are turning to specialised OSNs such as Disaboom, Xable, Disabled-Passions, Disabled Friends, Disabled Date, and Disabled United to communicate with friends, family or similarly disabled individuals (Ellis and Kent, 2010; Haller, 2010 and Asuncion, 2010). OSNs also provide an opportunity for these individuals to engage as a career resource when their disability can prevent them from physically networking at career events such as conferences:

"Social networking is completely fantastic. In terms of my career it's really important. If you go to a conference where you normally have to do good old fashioned, real life networking, meeting people, and shaking hands. That kind of thing is very difficult for me being blind, I can't necessarily go and pick out someone from a crowd who's just done a really good speech to talk to. I can't do that kind of thing but if I find out their name and where they work, for instance – perhaps a little bit later than everyone else, which is not as perfect, but is pretty useful." (AbilityNet, 2008: 6)

Specialised OSNs also allow individuals to mobilise politically and share disability related news and information (Haller, 2010 and Seymour and Lupton, 2004). Therefore these individuals often use these OSNs because they are marginally better (more accessible) than more mainstream OSNs such as

Facebook, Twitter, MySpace, and Bebo (AbilityNet, 2008). However specialised OSN users often want to participate equally in mainstream OSNs because this is often where their non-disabled friends and family members interact digitally.

2.5.1 Inaccessibility of online social networks

Studies such as AbilityNet (2008), Asuncion(2010) and Cahill and Hollier (2009) have explored the use of mainstream OSNs from the perspective of users with disability, specifically visually and cognitively impaired users, and have identified that OSN accessibility is a key facet that influences users acceptance of OSNs as an effective and alternative way to communicate.

According to Ellis and Kent (2010) inaccessibility of OSNs is often built in at the point of production. Their research suggests that universal design practice and policies for OSNs should be set in place early on to ensure access for individuals with disabilities who want to participate. However OSN providers have implied this is at the foreground of their mission statements. For example Facebook (2010) as cited in Ellis and Kent (2010:106) stated that Facebook "gives people the power to share and make the world more open and connected". To demonstrate this ideal Facebook launched a group called 'Facebook for Everyone' Ellis and Kent (2010) where users were encouraged to tell stories about how they were able to reconnect with people from their past.

Conversely this action spawned other groups claiming 'Facebook is not for Everyone' Ellis and Kent (2010). These groups identified that individuals with visual impairments were unable to access the OSN content, due to a use of Captcha, without support from a sighted individual. Ellis and Kent (2010) further explored this need for support by considering the individualisation and pathologisation of disability:

> "While asking a sighted person to assist in the [Facebook] sign-up stage may not seem like a very significant issue in the grand scheme of things, this needs to be considered within

> the history of the individualisation and pathologisation of disability. Historically, people with disability have had a helper/helped relationship with the able world – people with disability are attributed the help position and identity (Finkelstein, 1981). Captcha unnecessarily disables people with vision and cognitive impairments and puts them in the helped position,inviting charitable interpretations. [Therefore OSN] access needs to focus on independence rather than benevolent assistance." Ellis and Kent (2010: 102)

This is not the only example of users highlighting to OSN providers that their technology is not as accessible as they promote. A well-known Facebook group 'The Official Petition for a more Accessible Facebook launched before Facebook 2010 mission statement and claims that Facebook "repeatedly ignored accessibility" (Ellis and Kent, 2010). They identified that interacting with Facebook using any type of AT devices was impossible especially among users with vision or cognitive impairments who use screen readers or screen magnification software (Ellis and Kent, 2010). The group also acknowledged that Captcha was a key area of concern alongside gifts, newsfeed, preferences, drop down menus, drop down boxes, adjusting text size and user interface layout (McKay, 2007). The group believed that these issues addressed features of Facebook that are essential to a positive user experience. For example "in order to sign up on Facebook, a user must initially decode Captcha … people using adaptive technologies [AT devices] are unable to decode and reproduce this string of characters" (Ellis and Kent, 2010) meaning that they are unable to sign up to the OSN without a support individual.

Additionally AbilityNet (2008) explored the inaccessibility of Captcha within OSNs alongside several other concerns (see table 5) and rated Facebook 1 out of 5 stars for accessibility. Furthermore Foley and Voithofer (2008) reiterated the inaccessibility of Captcha within Facebook and determined that the technology provider reflected the disabling values of the people who design and maintain this limiting technology. The use of Captcha is not limited to Facebook. It is also seen within other mainstream OSN such as MySpace and Yahoo (Cahill and Hollier, 2009).

However OSN inaccessibility is not limited to Captcha, according to Cahill and Hollier (2009) the MySpace homepage failed W3C HTML validation with 101 errors. A subsequent study by Hollier

(2012) determined that other OSNs such as Facebook, LinkedIn, YouTube, and Twitter were also displaying WCAG 2.0 failures that include poor colour contrast, non-access for keyboard only users, inconsistent user interface layout and a lack of video captioning for deaf and hard of hearing users.

Additionally AbilityNet (2008) and Cahill and Hollier (2009) identified other inaccessible issues such as: drop down boxes that rely on JavaScript to be read and can cause problems for screen reader users who often have JavaScript turned off because it can change the content of the OSN (Foley and Voithofer, 2008); hidden and unexpected content that can often not be accessed with AT devices causing navigational difficulties for screen reader users (WebAIM, 2010); hard-coded text size that reduces the ability for blind and visionally impaired users to access content (Ellis and Kent, 2010); profile inconsistencies especially seen within MySpace where users are encouraged to 'pimp their profile' by adding features unique to their identity. For example users can select music to automatically load when other users navigate to their profile, this can often disrupt and disorient screen reader users (Ellis and Kent, 2010); cluttered pages that have many hyperlinks can also complicate interaction for blind and visually impaired individuals . For example MySpace has more than 100 hyperlinks on a profile (American Foundation for the Blind, 2006) making for an overwhelming experience for screen reader users. These users need to listen to whole webpages, from start to finish, top to bottom and from left to right, and as a consequence they are required to read through a lot of content before finding the desired hyperlink or content (American Foundation for the Blind, 2006). For example a visually impaired participant interviewed by AbilityNet (2008) reported "often the sheer amount of material on a page, and having no real idea how to begin to navigate such a large amount of information, makes it difficult to summon the will to continue!".

Additionally uploading videos has now (as of 2008) become common place within OSNs. However OSNs often do not convey to users the importance of captions for deaf and hearing impaired users. Currently only Yahoo and YouTube provide the option to add captions to their users (AbilityNet, 2008); and OSN's often serve as a platform for other applications that are run by external companies (Walker, 2010), for example Vampire Wars, Pirates, Cafe World and Farmville. These applications have over 80 million users on Facebook (Walker, 2010) thus they often bring additional inaccessibility issues to OSNs (Ellis and Kent, 2010). These issues and others are further discussed in table 3.

OSN	Cahill and Hollier (2009)	AbilityNet (2008)
Skype	Accessible [#2]. It must be conscious that new versions maintain the good work done to date.	Not tested.
Facebook	Accessible [#1]. Is a good choice for people with disabilities, however the registration is reliant on a Captcha with an audio alternative & graphical icons can also disappear when adopting contrasting colour schemes.	Very inaccessible [one star]. A professional looking exterior belies a range of accessibility issues for example uses Captcha as part of the registration, hard coded text on each page, many of the links do not make sense when read by screen readers and active JavaScript used is barrier for users who do not have this enabled.
YouTube	Somewhat accessible [#3]. Well presented and accessibility is offered well throughout the site.	Very inaccessible [one star]. It has a range of issues that can prevent disabled users using the websites to its potential for example it uses Captcha as part of the registration with no alternative text, hard coded text on each page, all video thumb nails in search result listings do not have alt text, registration uses AJAX to check the users username as it is being typed in but there are no warnings given to visually impaired users.
Flickr	Somewhat accessible [#4]. Users who are blind or visually impaired welcome page is not very clear. It is not intuitive what the site is for or what you are supposed to do. The search button is difficult to find because of the faint line around the edges. There are also discrepancies between accessible menu items and non-accessible menu items.	Not tested.
Twitter	Somewhat inaccessible [#5]. Fallen short of introducing a number of easy to install accessibility features for example no accessibility button to the accessible features of the website, registration makes use of Captcha and there is no audio option, the link is also very small making it difficult for a user with a vision impairment. Problems have also occurred when attempting to resize text as Twitter has text resizing locked. Also links can only be activated using a mouse and there are also no commands for deleting tweets or direct messages.	Not tested.

MySpace	Inaccessible [#6]. Failed to deliver an accessibility policy and has no evidence of accessible design built into the service for example Captcha is part of the registration process without an audio alternative. Also a large proportion of pages do not satisfy the web accessibility standards stated by W3C. Poorly formatted code causing accessibility problems for screen reader users.	Very inaccessible [one star]. Significant accessibility and usability issues across the website for example the homepage has a lot of content including animated adverts, uses Captcha as part of the registration with no alternative option, no alt text, no links to jump over the main navigation links for keyboard and screen reader users, hard coded text on each page, often a text label appears when you move the mouse over an image, many of the links do not make sense when read by screen readers, active JavaScript used which is barrier for users who do not have this enabled, poor playback of music and videos controls and users are unable to view friends updates on homepage.
Bebo	Not tested.	Very inaccessible [one star]. It uses Captcha as part of the registration, there is hard coded text on each page some of which is very small, there are no skip links across the website, throughout the website links become underlined as the user moves the mouse over them, there is no provision for keyboard users and active JavaScript is a barrier for users who do not have this enabled.
Yahoo	Not tested.	Inaccessible [two stars]. It uses Captcha as part of the registration but there is an alert for screen reader users (the registration page warns users of the potential Captcha difficultly). However an alternative method of registering is also offered. This involves contacting a Yahoo representative via email. The user is contacted and given a number. On calling this number the user is given the option to press 1 for billing enquiries, information on premium services or to report inappropriate content, press 2 for information on free services. On pressing 2 a message is given saying *"we do not offer telephone customer support for our free services"*. Furthermore Yahoo mail and chat user interface is inaccessible for keyboard only users, there are a number of links within the new webmail that 'pop up' windows without informing the user and there are no skip links across the website.

Table 3. Comparison of common accessibility issues among the eight most popular OSNs.

Additionally Boudreau (2011) also believed that OSNs are about users with disabilities communicating, sharing, interacting, contributing, bonding, and networking on the Internet. He also identified that people can get left behind based on physical disability, technological illiteracy,

appearance prejudices, and inaccessibility. The study involved a WCAG 2.0[1] audit of five popular OSNs that included Twitter, Facebook, LinkedIn, YouTube and Google Plus. The study found that LinkedIn was the most accessible of the five OSNs however it had a poor score of 29%. The study was repeated in 2012 and similar findings were observed.

As demonstrated by Boudreau (2011 and2012) and within table 3, studies that look at the inaccessibility of mainstream OSNs can be similar and or contradictory in nature. For example Cahill and Hollier (2009) suggest that Facebook is accessible and recommend it to individuals with disabilities. Whilst AbilityNet (2008) and Boudreau (2011) state it as being highly inaccessible. However they all agree that MySpace is highly inaccessible. These studies raise a question of trustworthiness when deciding whether mainstream OSNs are accessible or inaccessible. Furthermore these studies have only focused on blind or visually impaired users and marginally those with cognitive impairments. This means that there is a limited understanding of the requirements for users with physical disabilities especially those with cp.

2.5.2 Participation of users with disabilities

There are instances where access needs are assisted and or overcome allowing for individuals with disabilities to actively participate in mainstream OSNs. Asuncion (2010) looked at 723 post secondary students aged 16 to 65 years with disabilities who use mainstream OSNs in Canada: 32% psychological or psychiatric, 29% learning disability, 21% chronic medical or health problems, 11% visual impairment (low vision), 10% hearing impairment (hard of hearing), 3% blind and 2% deaf. The study found that 44% required software to improve writing quality, 24% screen readers, 16% dictation, 15% scanning and optical character recognition and 12% screen magnification software to use OSNs successfully.

The study also found that these users engaged in OSNs for up to 12 hours per week for non-school related activities and 6 hours per week for school related activities. Additionally the study identified that the students predominately used OSNs for watching videos on YouTube (79%), sending instant

[1] Web Content Accessibility Guidelines version 2.0.

messages on MSN, Google Talk and Skype (76%), searching for someone they know on Facebook (79%), and adding someone they know using Facebook (76%). The students were also listening to podcasts (19%), contributing to a blog (24%), reading Twitter posts (21%), adding someone they did not know to Facebook (21%), participating in multiplayer online gaming (19%), replying to or sharing someone's Twitter post (12%) and uploading videos to YouTube (11%). Furthermore the study found that students preferred to carry out these activities on YouTube (n=668), Facebook (n=614), Windows Live Messenger (n=531), Skype (n=279) and Twitter (n=162).

Similarly to Braithwaite et al (1999) and Ballin and Balandin (2007), the study also found that the students with disabilities identified communication and networking (53% friends and family, 42% keeping in touch and connecting with groups), access to non-school related information (23%), 'staying in the loop' (15%) and entertainment (15%) as key benefits to OSN participation.

Another study by Marshall et al (2006) looked at the benefits of OSNs among individuals with cognitive impairments. The study suggested that OSNs encourage these users to create their own online identities. They believed that OSNs allowed individuals with cognitive impairments to socialise and build friendships in a private space without feeling inhibited or constrained by the presence of authority figures (or support individuals , this was further explored and confirmed by Raskind et al (2007). Additionally OSNs also provide academic skills improvement for people with cognitive impairments as they can encourage more reading and writing.

Conversely it was determined that when these individuals used OSNs their reading difficulties might cause them to misunderstand the writing of others for example "their own writing difficulties might cause them to make embarrassing mistakes in their own messages and fail to communicate their intending meaning. Such problems could in turn have negative social consequences" (Ellis and Kent, 2010). AT devices for example spell checker software (see chapter 2 section 2.4.3) can often alleviate this however as discussed in chapter section 2.5.1 inaccessibility and AT devices accommodation is a major issue within OSNs meaning such affordances are often left unmet (Ellis and Kent, 2010).

2.5.3 Participation of users with cerebral palsy

There have been no studies that explicitly focus on OSN use amongst individuals with cp. However there have been studies that look at physical disabilities that could include these individuals. Grimaldi and Goette (1999) examined the role of the Internet and its effect on the level of perceived independence among individuals with physical disabilities. The study found that OSNs have a more positive effect regarding the development of independence than other Internet-based technology because they allow users with physical disabilities to communicate with others effortlessly.

This idea was initially explored in Patrick and Black (1997) and then Quatermann (2007). They suggested that this richness helped communication and could improve quality of life for these individuals. Additionally Grimaldi and Goette (1999) believed this was why users with physical disabilities were increasingly using the Internet.

Another study by Braithwaite et al (1999) did not explicitly look at OSNs use but rather online social support within forums for people with disabilities[2]. The study analysed 1,472 messages from 42 unique sender names. It identified that most of the forum members were individuals with physical disabilities but the study did not specify the type of physical disability. Content analysis of the messages determined that the behaviours evident within the forum were of information support, tangible assistance, network support and emotional support. The study also found online social support websites had three key benefits:

1. Allowing individuals to overcome mobility related challenges that prevent participation in face-to-face groups, though this was initially investigated by Fullmer and Majumder (1991) and Fullmer and Wallsa (1994),
2. Individuals who experience partial or complete loss of ability to communicate using their natural speech found the computer allows them to develop and respond to messages at their own speed and to send coherent and complete messages, this was reiterated by Banks (1999)

[2] A verbal and nonverbal communication between recipients and providers that reduces uncertainty about the situation, the self, the other, or the relationships, and functions to enhance a perception of personal control in one's experience. For persons with health problems, however, the acquisition of face-to-face support may be problematic (Braithwaite et al, 1999).

and Ballin and Balandin (2007),

3. Large groups of like-minded individuals can often provide and promote a sense of universality and community amongst individuals with disabilities. This is because individuals with disabilities find being part of a large cultural group can help with adjustments specifically isolation, depression and alienation, this was further echoed by Ballin and Balandin (2007).

Studies such as these have not involved the users, defined what constitutes disability or focused on cp without encompassing other disabilities, making it impossible to identify the requirements of OSN users with cp. Others studies such as Braithwaite et al (1999) did not focus on cp without encompassing other physical or non-physical disabilities. Studies such as Boudreau (2011) did not include the populations in the research, instead opting for expert audits. Meanwhile Manna et al (2005) surveyed 668 adults with disabilities. The study discovered that 76% of people with disabilities aged 60 and under and 79.1% of people with disabilities over 60 used their computer for social contact but the type of contact was unspecified.

Additionally Dobransky and Hargittai (2006) asked participants to define their disabilities using broad statements for example “Do you have difficulty going outside the home alone, for example, to shop or visit a doctor’s office, because of a physical or mental health condition lasting 6 months or longer?”. Manna et al (2005) asked participants to define their disabilities by referring to their limitations for example fine motor, muscle weakness, leg or arm paralysis, speech or other. Therefore such studies have made it impossible to identify the requirements of OSN users with cp.

Thus the goal of this PhD research is to address this gap in the research to make this community visible.

2.6 Theory: change

Initially this PhD research explored the experiences and challenges faced when adults with cp use OSNs. Fourteen interviews were carried out consisting of participants with variations of the disability (see chapter 3). The study identified the reasons for use and non-use of OSN by individuals with cp and also discovered key themes together with challenges that affected their experiences. This was followed by an in-context observational study (see chapter 4) that examined their context of use specificallyOSNs and AT devices used, tasks carried out and users feelings during interaction. As a result of these studies it was determined that changing OSNs prevented and or slows these users ability to communicate online.

Thus this section will provide insight into change answering: what is change, what are the most accepted theories and approaches, types of deployment, and examples of change acceptance and failure. To answer these questions a variety of change ideas will be discussed from different fields. This will allow for a deeper understanding of the literature thus ensuring the most appropriate ideas are used within this PhD research.

2.6.1 Definition

Change is generically expressed as an “act or fact of changing; substitutions of one thing for another; succession of one thing in place of another” (Oxford University Press, 1989). However it can be observed as four distinct realms:

- Transactional where change is introduced to improve the existing operation and its outputs,
- Incremental’ which is gradual and does not allow one to return to the original state,
- Radical’ a pivotal moment leading to major downsizing or restructuring,
- Transformational’ if the original state loses touch with shifting understanding or advancements (Holbeche, 2006).

2.6.2 Theory

Change can be expressed in different ways depending on the field of knowledge. However the messages conveyed often display commonalities. According to Kritsonis (2004) there is no right or wrong way to deal with change. Theorists such as Lewin (1952), Carey (1999b) and Griffith (2001) attempt to offer a better understanding that secure successful change but no one theory is accepted. Furthermore contradictions, adaptations and exclusions are continually being made.

2.6.3 Understanding change

2.6.3.1 Paradoxical theory of change

How one experiences and accepts change is otherwise known as the paradoxical theory of change that has been put forward by psychologists (Beisser, 2004). The theory considers how change can successfully occur:

"When one becomes what (s)he is, not what (s)he tries to become what (s)he is not – change does not take place through a coercive attempt by the individual or by another person to change (her)him, but it does take place if one takes the time and effort to be what (s)he is – to be fully invested in [her]his current positions. By rejecting the role of change agent (Maurer, 2003), we make meaningful and orderly change possible" (Maurer (2003:1).

However most psychologists believe this understanding is flawed. Those practicing Gestalt techniques[3] for example believe that change will only occur when an "individual abandons what we would like to become (or what s/he wants something to become) and attempts to be what s/he is (or attempts to accept what something is), without trying, coercion or persuasion etc" (Maurer, 2003:1).

Non-psychologists have also stumbled upon this similar understanding i.e. change should be undertaken slowly and the abandonment of one state to accept another is the only way to secure successful change. This understanding of change is important for this PhD research as it provides a

[3] Gestalt technique teaches therapists and patients the phenomenological method of awareness, in which perceiving, feeling, and acting are distinguished from interpreting and reshuffling pre-existing attitudes, in other words "patients are therapists". The goal is for clients to become aware of what they are doing, how they are doing it, and how they can change themselves, and at the same time, to learn to accept and value themselves (Yontef, 1993).

clear definition and high-level process of how change should be carried out.

2.6.3.2 Knowledge-as-theory

Knowledge-as-theory looks at change conceptually whilst focusing on the process of how one learns and changes to meet the new conception. Prominent conceptual theorists such as Posner et al (1982) cited in Ozdemir (2007: 351) interpret change as:

"[Individual'] current conception is functional and if the [individual] can solve problems with the existing conceptual schema, then the [individual] does not feel a need to change the current conception. Even when the current conception does not successfully solve some problems, the [individual] may make only moderate changes to his or her conceptions" This perspective of change is important for this PhD research as it offers an understanding of how one learns to accept change. Furthermore this need to carry out moderate changes to a conception is often referred to as conceptual capture or weak restructuring . Whilst the theory considers unspecified moderate changes, it also (minimally) looks at unspecified radical, large and unexpected, changes often referred to as conceptual exchange or radical restructuring (Ozdemir, 2007 and Carey, 1987). It is believed that understanding the different levels of change is important to this PhD research as it is apparent OSNs deploy change at varied levels (see chapter 3 and 4).

Though examples of conceptual capture or exchange are not discussed in the theory it does identify a method for successfully accepting a new conception. Knowledge-as-theory states that for successful change to occur the conception must be:

- Intelligible (clear enough to make sense to the individual),
- Plausible (must be seen as plausibly true),
- Fruitful (appears productive to the individual for solving current problems) (Ozdemir, 2007: 354).

Contradictory to the paradoxical change theory, knowledge-as-theory suggests that a cognitive

conflict, a conception that is assimilated but not accommodated by the individual must be introduced causing said individual to become dissatisfied with the current conception (Tall, 1977). This dissatisfaction encourages the individual to consider intelligible, plausible and fruitful ideas offered by the new conception, therefore causing conceptual change to occur i.e. change occurs through abstraction were the individual is pulled towards different possibilities (Ozdemir, 2007 and Ford and Ford, 1994). This understanding of change is important for this PhD research as it offers a criteria for successful acceptance.

2.6.3.3 Conceptual change

The ideas explored in knowledge-as-theory are also looked at by Ohlsson (2009) cited in Chinn and Samarapungavan (2009) where resumption (an act or an instance of resuming; a beginning again (Free Online Dictionary, 2002)) is given high importance when defining conceptual change. Ohlsson (2009) suggests that change can only occur when a person:

"Uses analogical transfer [transferring of a basic structure acquired through one or more instances to another instance (Klauer, 1989)] to map conceptual system B from one domain to new domain (domain A) to which it had not previously been applied, and to which conceptual system A had been predominant. When said individual realizes that conceptual system B can be applied to domain A, the individual now has two alternative ways of conceptualizing domain A – either conceptual system A or B. Through competitive evaluation of the cognitive utility of the two conceptual systems, the individual eventually settles on one or the other as the favored conceptual system" (Chinn and Samarapungavan, 2009: 51).

This idea is very similar to knowledge-as-theory howeverOhlsson (2009) promotes an understanding of the conceptions to encourage an overlap that ultimately leads to change acceptance. To do this Ohlsson (2009) refers to the conception as a belief or an understanding rather than knowledge (Chinn and Samarapungavan, 2009: 53) for example. "a person may have a conceptual structure for an idea that heat is a fluid, and the person may believe that this is true but it seems inappropriate to us to refer to clearly false ideas as knowledge but rather understandings" . The role of overlapping of state A and

state B during change deployment is important for this PhD research as it offers a solution to deal with change.

As a result Ohlsson (2009) believes that conceptual change can only occur if there are changes in an individuals belief or understanding of a system. However there are differences between the two for example they stated that an individual "may understand evolution but have a belief in creationism" Chinn and Samarapungavan (2009: 53). This means when change agents plan change they must promote both belief and understanding simultaneously. Additionally the promotion of belief and understanding at this level is important for this PhD research as it offers an another approach to dealing with change.

2.6.3.4 Multiple routes of conceptual change

Conceptual overlap is not an isolated idea among change theorists, Carey (1999a) and Carey (1999b) explored this idea further by considering change between concepts rather than conceptions. The work offers three processes: replacement, differentiation, and coalescence whereby "one concept displaces another concept, where the two concepts are fundamentally different, it is an overwrite procedure" (Ozdemir, 2007).

Unlike Carey (1999a) and Carey (1999b) do not consider a natural acceptance but promotes an understanding of concepts than what is offered by knowledge-as-theory. Using eccentric examples such as how children better their learning and effective dog breeding (Carey, 1999a). Whilst Carey (1999b) places emphasis on a gradual process of conception, reiterating that change agents must approach change slowly. However some conceptual change theorists believe that theories like the paradoxical theory of change, knowledge-as-theory and Carey (1999b) are too narrow and incomplete. Thus these works will not be viewed as relevant for this PhD research.

Additionally theorist such as Chinn and Samarapungavan (2009) propose multiple routes to conceptual change inferring change would be most successful if change agents were to act as foxes (those who consider many routes to how change can occur) rather than hedgehogs (those who consider only one route to change,) similarly as promoted by knowledge-as-theory and Ohlsson (2009).

Chinn and Samarapungavan (2009) suggest such routes are defined by the individual initial and final conceptions: the trajectories along which change occurs; the process that the individual engages in driving change; the obstacles that impede change; and factors that promote change. To do this Chinn and Samarapungavan (2009) puts forward ten potential routes whereby change can occur these include:

- Modification of the old conception to fit the new conception,
- Modification of the new conception before it can be subsumed by the old conception,
- Continuous revision of the old conception that leads to the new conception Chinn and Samarapungavan (2009: 52).

Furthermore Chinn and Samarapungavan (2009) have stated that no one route is correct and that successful change agents need to understand that change is not narrow but has influences. This means that one idea does not always fit all situations. The ten potential routes to change put forward by Chinn and Samarapungavan (2009) are important for this PhD research as they offer guidance to deploy change. Additionally their idea that change can be influenced is interesting though the work does not specify these influences. Therefore this PhD research will need to be observant of potential influences.

Thus the ideas expressed by Ohlsson (2009) and Chinn and Samarapungavan (2009) are grounded by previous work and can be viewed in change management approaches currently used by OSNs (see section 5.2.2) thus it is believed that this work is most relevant to this PhD research.

2.6.4 Reason for change

It is believed that identifying why change occurs is important to understanding the approaches used to deploy change. A study by Woodward and Hendry (2004) asked 198 organizations about the change they have experienced and four key triggers for change were identified. These included increased competition, changing or new customer needs, customer expectations, and technological developments (see figure 11). Additionally a study by Holbeche (2006) reiterated Woodward and Hendry (2004) findings identified additional factors for example economy, social context i.e. customer demographics, fragmentation and attitudes, and a need to increase productivity.

Trigger	%
Increased competition	67
Changing/new customer needs and expections	55
Technological developments	43
Internationalization/globalization	35
Disappointing financial performance	31
Legislation/regulation	31
New CEO	26
New competitors	25
Change in ownership	21
Industry in recession	12
Other	15

Figure 5. Triggers for organizational change (Woodward and Hendry, 2004**)**

Unfortunately work focusing on OSN change is unavailable thus organizational change was discussed. Though these examples are unrelated to OSN they do offer relatable reasons for change deployment, for example OSN providers are likely experiencing increased competition such as interface features, changing or new OSN user needs and technological developments etc.

2.6.5 Deploying change

It is believed that identifying why change occurs will provide a in-depth understanding of the approaches used to deploy change.

2.6.5.1 Lewin three-step model

Lewin (1951) put forward a three-step model that identifies the driving forces that facilitate and restrain change (see figure 12).

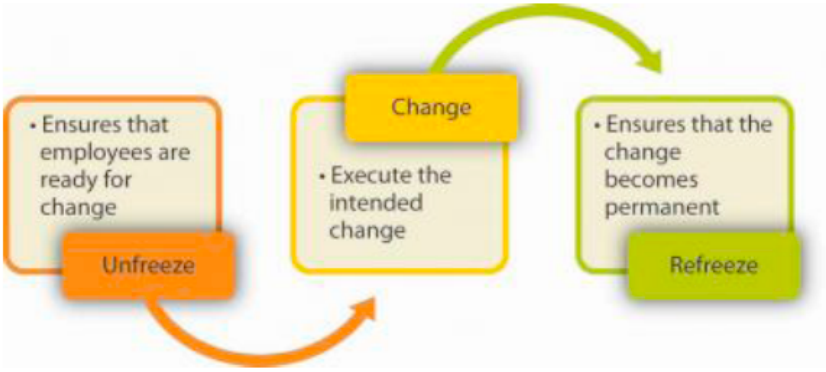


Figure 6. Lewin (1951) three-step model for change management (Kritsonis, 2004 and Wirth, 2004)

According to Kritsonis (2004) and Wirth (2004) step one of the Lewin (1951) model is to unfreeze the existing situation in order to overcome the strains of individual resistance and group conformity; step two is to persuade employees to agree that the existing situation is not beneficial to them and encourage them to view the problem from a fresh perspective; and step three is to refreeze the new situation to stabilize the equilibrium resulting from the change. The ideas expressed by Lewin (1951) often act as a baseline for other change management approaches, therefore this work has been deemed most relevant to this PhD research.

2.6.5.2 Lippitt model

Lippitt (1958) further expanded on the Lewin (1951) model offering additional steps. The model focuses on the responsibility of the change agent not the change itself Kritsonis (2004). The approach involves:

1. Diagnosis of the problem,
2. Assessing the motivation and capacity for change,
3. Assessing the resources and motivation of the change agent,
4. Choosing progressive change objects (action plans and strategies),
5. Change agent role should be selected and clearly understood by all parties,
6. Maintain the change through communication, feedback, and group coordination,
7. Gradually eliminate the helping relationship (the importance of gradual change is also inferred by Carey (1999b)).

As Lippitt (1958) expands on Lewin (1951) it has been deemed an important introduction within this PhD research.

2.6.5.3 Planned change

Holbeche (2006) puts forward a planned approach to change that believes that change is executed successfully if it is well planned and controlled. This approach has been included as it provides a clear guide to deploying change thus has been deem relevant to this PhD research. Holbeche (2006) approach considers:

1. Preparing the ground (scanning and choosing). This involves reading the signals of the individuals involved in the change, identifying the need and deciding or desired outcomes. It states that change agents should be clear about the reasons for change, identifying driving forces, desire outcomes and briefing those involved,
2. Diagnosing the situation (planning). This involves identifying and evaluating options and deciding on a change strategy that includes consulting others, determining resources and time scales, and getting commitment for action,
3. Bringing about change (implementing and reviewing). This involves implementing the change and evaluating the outcomes by taking action, being open to change, engaging people,

reminding others of their commitments, getting things done, reviews and learning, and recognising and rewarding those involved.

2.6.5.4 Hard and soft systems

Holbeche (2006) has suggested that system thinking can be helpful in defining and gaining commitment to change (see chapter 2 section 2.6.3.5). However system thinking suggests that the issue, events and incidents should not be viewed as isolated phenomena but seen as interconnected, interdependent components of a complex entity Holbeche (2006). As a result, Holbeche (2006) also puts forward hard systems and soft system approaches that have also been considered relevant for this PhD research:

2.6.5.4.1 Hard systems

Holbeche (2006) recommends that a hard system methodology is used when the problem is clearly defined, and the degree of clarity and stability is high. The methodology states:

- Define the problem (what needs to change?)
- Analyse existing situation and relevant systems (where are we now?)
- Identify objectives and constraints (where would we like to be?)
- Generate ways of meeting objectives (how would we get there?)
- Formulate measures of performance (how will we know when we have achieved the change?)
- Develop options (what would the options be?)
- Test these options (are they feasible/achievable/within budget?)
- Choose to implement the most relevant option (choice i.e. politics, power, equity)
- Implement option (implementation offers additional problems that require solving).

2.6.5.4.2 Soft systems

In situations were little or no agreement about the problem is made soft system methodology is used (Holbeche, 2006). The methodology was developed by Checkland (1981) and is a way of securing commitment, it requires:

1. Problem expression,

2. The situation is analysed to developing a rich picture of all the elements that people think are involved in the problem,
3. Relevant systems and root definitions, i.e. the issues and key tasks, become the basis for defining and agreeing relevant systems,
4. Conceptional model that considers efficacy, efficiency, effectiveness, ethicality, and elegance,
5. Comparing steps 3 and 4, the conceptional model (developed in step 4) is used to compare with the current system,
6. Debate feasible and desirable changes,
7. Action, i.e. the agreed changes are implemented (Holbeche, 2006).

The approaches discussed by Holbeche (2006) have been included as they offer recent examples of change deployment that is similar to those put forward by Lewin (1951) and Lippitt (1958).

2.6.5.5 Prochaska and DiClemente change theory

The approaches discussed previously are highly linear in deployment suggesting that successful change does not take into account human error or non-acceptance. Thus Prochaska and DiClemente (1982) understand that individuals do not always accept change the first time around, thus they put forward a theory that is circular.

Prochaska and DiClemente (1982) change theory draws upon theories rooted in psychology that demonstrate the general process of change that people pass through, whilst taking into account human errors and non-acceptance. According to Kritsonis (2004) the theory considers:

1. Precontempation, individual is unaware or fails to acknowledge the problems without engaging in any change process activities,
2. Contemplation, individual raises consciousness of the issue,
3. Preparation, individual is ready to change their behavior and plans to do so within two weeks,
4. Action, individual begins to engage in change activities,
5. Maintenance, actions to reinforce the change are taken coupled with establishing the new

behavioral change.

Prochaska and DiClemente (1982) change theory has been considered important for this PhD research because it considers the users and the errors they are likely to make. This understanding has not been covered within previous discussed approaches.

2.6.5.6 Griffith Nine-step guideline for change

The approaches discussed have denoted the following question "how can these models or approaches be used in an natural environment?". Griffith (2001) offers a crude answer though he focuses on organizational change that is based on his personal experiences. Thus this work cannot be taken as fact but it offers insight into how change deployment can occur within a natural setting[4]. Griffith (2001) work is not related to OSN change though it has been deemed useful as no other examples are available.

1. New arrival in an organization, usually senior management position, is worried about the organization position, sustainability and purpose. S/he has also experienced similar required changes in other organizations and consults a change management consultant,
2. Change management is discussed with high-level employees to identify, who will set out the proposal for the program,
3. Program design is reached,
4. Program design circulated to high-level employees, and the following steps are identified:
    a. An event setting out a case for change,
    b. Events for key players to prepare them for change proposed,
    c. Simultaneous work by the inner circle (or sub-group) on a plan for implementing the change,
    d. Production of a document by the change consultant which reports the process so far and sets out plan for future actions,
    e. Series of events aimed at stakeholders, their purpose is to deal with their response to the document and process,

[4] Other ways to gain insights into change include SWOT analysis, focus groups and the formulation of mission statements.

f. Final decision-making process on the implementation plan to board members,

g. Dissemination and commencement of the confirmed implementation plan

h. Review of the whole process and its effectiveness or success,

5. Other organization members will now have wind of something happening and an early announcement is made to address concerns and confusions,

6. Program gets underway and early antagonists are further alienated by the initial events however mild skeptics later join them,

7. Inner circle (high-level employees) begin to stick closely as possible to the original program design and will not review unless crisis,

8. The program is continued and completed with some minor adjustments,

9. Celebratory activity for all remaining (and new) stakeholders is proposed regardless of the emotional condition of those who have survived (or arrived).

2.6.6 Change deployment within HCI

To identify whether the understanding of change is discussed within HCI or whether the theories and or approaches are similar or dissimilar further literature was reviewed. It was determined that change e is often discussed during software development and is restricted to identifying scenarios and tools that assist change management within IT (Jarke and Kurkisuonio, 1998). For example Kowalczykiewicz and Weiss (2002) developed software that notified developers of changes within a unified development platform. The work suggested that current change management approaches within and outside the HCI field attempt to formalise all activities concerning the deployment of a change i.e. each change must be requested, numbered, accepted, implemented and tested to prove it's goals. Kowalczykiewicz and Weiss (2002) believed that these approaches are expensive and tedious for change agents to follow. The work identified that both large and small projects regularly undergo change and that the cause of the change is external (for example unstable customer requirements) or internal (for example replacement of development tools).

Additionally Kowalczykiewicz and Weiss (2002) looked at how system change could be introduced through a traceability module ; how it affects other parts of the development i.e. when change is

introduced to one element of the project it will usually affect other areas; and how uncontrolled changes can cause developer frustration because they are unable to grasp what is being changed and how it affects different parts of the system. This is referred to as project destabilisation.

According to Kowalczykiewicz and Weiss (2002) most solutions dealing with change management are based on software engineering processes. For example "A-B testing" considers two versions of an element and a metric that defines success . This process is good for quick comparisons of two different systems but does not allow for users opinions (Webcredible, 2012).

The change ideals behind these popular processes have been radically altered by Beck (2000), who put forward agile software development (Kowalczykiewicz and Weiss, 2002). Agile approaches such as eXtreme Programming, Agile Unified Process or Scrum attempt to embrace change by making sure the separation of concerns does not take place. It promotes adaptive planning, evolutionary development and delivery, a time-boxed iterative approach, and encourages rapid and quick responses to change and continuous development (Kowalczykiewicz and Weiss, 2002, Beck et al, 2001 andAmbler, 2011) .

Essentially Agile ensures each member of the project knows as much about the system as every other member (Kowalczykiewicz and Weiss, 2002) therefore allowing the project (the team, stakeholder and their representatives) to adapt to change quickly reducing the likelihood of project destabilisation (Beck and Kent, 1999).

2.6.7 Acceptance and failure

Dobson (2000) states that change is a fact of life and pressures within our lives, whether personal or professional, are forcing change agents to deliver change faster and more fundamentally that ever before . Consequently it is unsurprising that Griffith (2001) stated that it is "not hard to find stories of change failure whether from the literature, encode or personal experience. Nor is it hard to find claims that failure is the norm rather than exception". There is no shortage of research that looks at the

reasons for change failure. These studies offer no agreed basis for addressing shortfalls in theories or approaches (Higgs and Rowland, 2000). However change theorists are highly skeptical of new (or amended) change methods and approaches as they believe an unbreakable cycle is in motion "change efforts is made, it runs into trouble, it gets reviewed, and the conclusion is drawn that change should have been managed better" (Griffith, 2001).

One question has been considered: how do the change process and change failures affect individuals?

Prominent coping[5] theorists such as Woodward and Hendry (2004) suggest "transition can be difficult where change is radical [currently this is preferred] than incremental" and will often cause internal pressures that can be translated into stress, which is often referred to interchangeably as either pain or damage. However Griffith (2001) states that there is a difference between the two. An individual will experience pain regularly throughout their lives and develop better or worse ways of coping with it.

The research suggests that change often causes pain and that this pain is often compounded if someone in authority informs the affected individual that s/he is empowered and enabled to contribute to the change process. If this does not happen the individual will experience not just pain but also disabling confusion, and if said change agent continually insists such pain has not occurred, while the individual is sure it has the individual is at risk of being permanently damaged (Griffith, 2001). This idea was reiterated in By (2007). Additionally Woodward and Hendry (2004) further explored this idea and puts forward a list of criteria:

1. Increased accountability but reduced resources,
2. A focus on tasks with a corresponding neglect of employees,
3. Feeling of insecurity and uncertainty in roles and direction,
4. Other employees not coping (deferred stress),
5. Lack of skills to adapt,
6. Managers themselves failing to cope and employing poor coping strategies.

[5] Coping is proposed as the key to peoples maintaining well-being and satisfactory performance.

The situations described by Griffith (2001), Woodward and Hendry (2004) and By (2007) are not uncommon in fact they are expected. It is believed that if change agents are aware of what an affected individual is thinking during the onset of pain it will help to minimize or prevent damage. Woodward and Hendry (2004) identify that individuals are continually evaluating the change process:

1. What will I gain?
2. What will I lose?
3. What are the potential benefits or harm to me?
4. Is what is happening irrelevant, can I ignore it?
5. What can I do to overcome or prevent the negative effects?
6. What can I do to improve my prospects for benefitting from change?
7. What coping options might be worth adopting?
8. What are the likely consequences?
9. Will I accomplish what I want to achieve?

This continual questioning can often confound stress resulting in pain. To reduce these questions Woodward and Hendry (2004) recommend that change agents offer coping strategies (that are problem or emotion focused) to affected individuals for example innovative coping, an outwardly-directed form of coping where employees can lead, either individually or as a team, to reduce their stress more effectively. Furthermore Woodward and Hendry (2004) have also developed a leading and coping with change framework that offers affected individuals techniques, including communicating with others who hold different perspectives, organizing work and managing time effectively, assimilate and interpret information, deal with people and carry out innovative problem-solving.

Through dealing with these questions it is hoped that those experiencing change do not "propose of the change effort ... successful change [only] occurs when people change their behavior to suit the circumstance" (Holbeche, 2006). This will only occur by understanding the reasons for change reducing individual damage and a clear user centric change process. It is believed that this work is relevant to this PhD research as it offers greater understanding of the affects of change on those effected by it.

2.6.8 Change within web accessibility

To identify whether change (understanding or deployment) is discussed within web accessibility (a facet of HCI) additional literature was reviewed. The work identified that Hollier (2012) reiterated this PhD research (Lewis, 2010) by identifying changing OSNs as a key barrier to users with unspecified disabilities. The study asked 49 people with different disabilities in various age groups and with different patterns of OSN use to share their experiences about how they overcome OSN barriers. The key premise of the study was to ascertain a list of web accessibility barriers when using OSNs and to offer guidance to help users with disabilities to participate in OSNs. The study merely presented frequent changing OSNs as a barrier with no further explanation, examples or indication for future work. This has been the only instance were changing OSNs related to individuals with disabilities have been mentioned in HCI literature.

To identify whether change is considered in other areas of web accessibility recognized guidelines, standards or laws available to OSNs providers were consulted, these included:

- Architectural and Transportation Barriers Compliance Board - 36 CFR Part 1194 Electronic and Information Technology Accessibility Standards; Final Rule,
- COI Delivering inclusive websites version 2002 1.2,
- Disability Discrimination Act 1995 1995 chapter 50,
- Disability Discrimination Act 2005 2005 chapter 13,
- COI Minimum technical standards version 2002 1.1,
- Publicity Available Specification (PAS 78: 2006) Guide to good practice in commissioning accessible websites,
- COI Online video guidelines version 1.0 2010,
- 2009 Guidelines for UK Government websites Illustrated handbook for Web management teams – focusing on users needs,
- 2009 Guidelines for UK Government websites Illustrated handbook for Web management teams – Building in universal accessibility,

- 2009 Guidelines for UK Government websites Illustrated handbook for Web management teams – Information and text,
- Draft BS 8878 Web accessibility – Building accessible experiences for disabled people – Code of practice (2009).

It was found that change is not explicitly discussed within web accessibility guidelines, standards or laws, however some of the documents discuss ‘maintenance’. However the advice given is brief, for example “when maintaining your website you should ensure said [guidelines/standards/law] are in place” (BS8878, 2009). Furthermore they do not offer a process for carrying out said change. This means OSN providers that want to ensure they carry out change successfully with minimal user damage to disabled users, specifically those with cp, do not have direct literature at hand. This does not mean that OSN providers attempt to deploy change blindly but it is likely they are pulling on resources and experiences of their employees, or are comparing change deployment among their competitors or are referring to change management literature.

2.7 Methodology

This PhD research will use qualitative approaches that will be analysed inductively to answer the research questions (see chapter 1, section 1.4). This section will provide an insight into the overarching inductive methodology used throughout the PhD research.

2.7.1 Inductive verse deductive approach

HCI researchers often refer to two broad methods of reasoning: deductive and inductive (Burney, 2008). Deductive approaches refer to reasoning that goes from generic to specific i.e. a top-down approach (Queens University Belfast, 2011 and Burney, 2008) . According to Queens University Belfast (2011) deductive reasoning works by thinking of a theory about a topic and then narrowing it down to a specific hypothesis that can be tested. It is then narrowed to produce observations for the hypothesis. These are then used to accept or reject the hypothesis which will in turn confirm or refute the original theory .

Inductive reasoning works the other way, observations towards generalisations and theories (Queens University Belfast, 2011 and Burney, 2008) and is often referred to as a bottom-up approach. It starts from specific observations, looks for patterns or no patterns, regularities or irregularities to formulate a hypothesis which is used to develop general theories or draw conclusions . Thus inductive approaches are generally open-ended and exploratory at the beginning whereas deductive approaches are narrow in nature and concerned with testing and confirming hypothesis (Queens University Belfast, 2011and Burney, 2008).

2.7.2 General inductive approach

Inductive reasoning has been deemed appropriate for this PhD research, specifically the general inductive approach (GIA) that was put forward by Thomas (2006) because it provides a systematic procedure for analysing qualitative data. Similar to grounded theory, a systematic methodology in social sciences involving the discovery of theory through the analysis of data (Martin, 1986 and Faggiolani, 2011). GIA permits research findings to emerge from the frequent, dominant, or significant

themes inherent in the raw data, without the restraints imposed by structured methodologies (Thomas, 2006).

Due to the exploratory nature of this PhD research this approach allows the qualitative data to speak for itself without external influences. Furthermore due to the general nature of the approach it is easily adapted to suit the needs of different types of qualitative research expressed in this PhD research for example interviews (see chapter 3), observations (see chapter 4), text analysis (see chapters 5 and 6) and a questionnaire (see chapter 7).

The GIA consists of six stages: data cleaning, close reading of the data, overlapping coding and uncoded data and continuing revision, refinement of category system and category model (Thomas, 2006) (see figure 21). These stages will be discussed in depth in subsequent chapters.

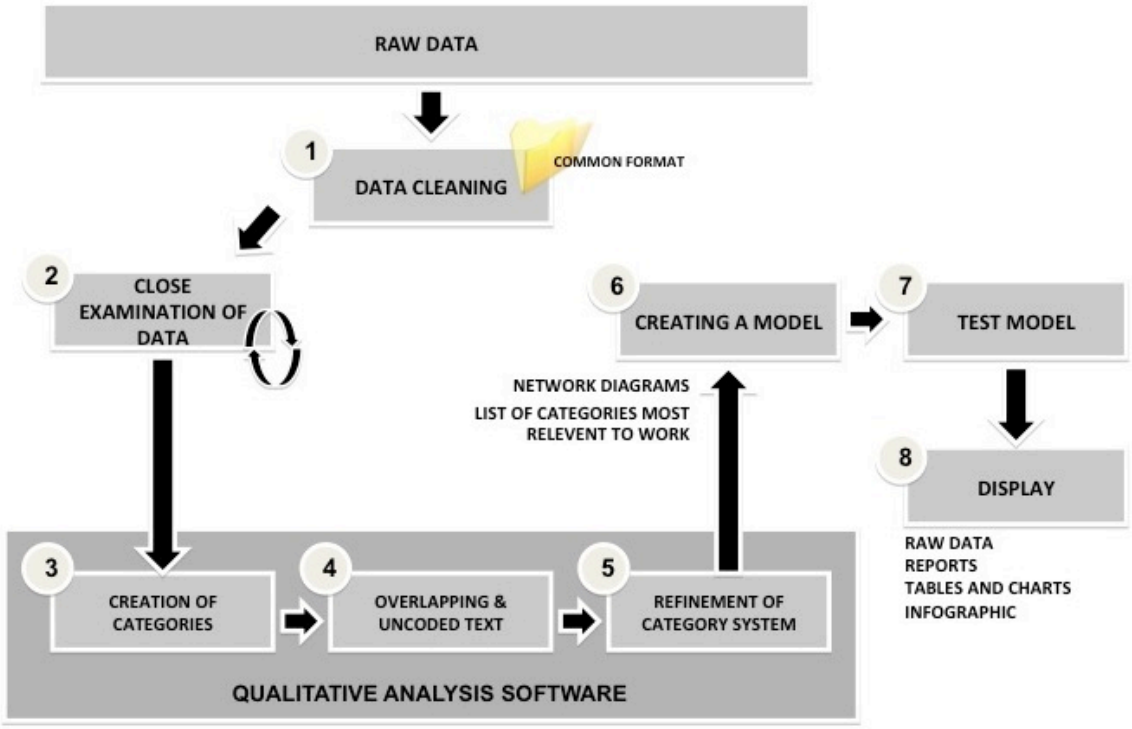


Figure 7. General inductive approach (copyright has been granted, developed by author)

Chapter 3 – Study One: Exploratory interviews

3.1 Introduction

To answer research question one and two: what is the current situation of OSN use among adults with cp? What are the key inhibiting factors that prevent and or slow OSN use among adults with cp?. An exploratory interview study that investigated computer, Internet and online communication use among adults, age 18 and above, with cp was completed in 2009.

Exploratory interviews were used because they allow an overview of the current situation to be gathered without prior hypothesis or bias. Due to the exploratory nature of the study it was decided that the interviews would broadly (indirectly) look at OSNs. The term 'online communication' was used to establish the role of OSNs without explicitly referring to it. Additionally the context surrounding OSN use were also looked at for example computer and Internet use.

The study received ethical clearance from City University London and was published in ASSETS'2010 and Accessibility 2.0 Million Flowers Bloom 2010 (see appendix c section c.1 and c. 6).

This chapter reports the study questions, method (recruitment, interview design and protocol, apparatus and materials, and subjects), organisation of data, and the findings.

3.2 Study questions

The study questions addressed were:

1. Why are adults with cp using computers, Internet and/or online communication?
2. Why are adults with cp not using computers, Internet and/or online communication?
3. Where and when do adults with cp use computers, Internet and/or online communication?
4. What support is required for adults with cp to use computers, Internet and/or online communication?

5. What problems are faced when adults with cp use computers, Internet and/or online communication?
6. What types of offline communication do adults with cp use?[6]
7. What do adults with cp feel are the positive and negative aspects of using online communication?
8. How would adults with cp like to use computers, Internet and/or online communication?

3.3 Method

3.3.1 Recruitment

The study used open recruitment; initially adults from all City University London programmes, departments and professions were recruited using posters (see appendix a section a.1.1). Additionally recruitment occurred externally. Despite this, recruitment of 14 participants took 10 months.

Recruitment presented a challenge because the Data Protection Act of 1998 states that organisations cannot not provide details of any individual. In this instance organisations could not provide details of staff, students or clients with cp. This meant recruitment relied on potential participants seeing the posters or hearing about the study. Due to the vulnerability and, in cases, isolation and loneliness of these individuals (Ballin and Balandin, 2007) it was apparent that this form of recruitment was ineffective.

The solution was to make the study and myself visible within the cp community. I began by reaching out to City University London Disability Learning Success placing posters on their notice boards; approaching public sector departments and organisations within the Royal Borough of Kensington and Chelsea (RBKC) that had access to the local cp community. Presentations were given to managers, youth workers, social workers and disability forum members, and posters were placed on their notice boards; community centres and young adult clubs directed at RBKC residents with cp were visited and organisers were encouraged to inform their clients about the study. Finally an advertisement was

[6] During the construction of the study questions ‘offline communication’ (face-to-face, telephone, letter and or text message communication) was added providing further insight into how people with cp communicated.

placed in the Action Disability Kensington and Chelsea (ADKC) newsletter which was sent to 1,200 disabled residents, including those with cp, within RBKC (see figure 22).

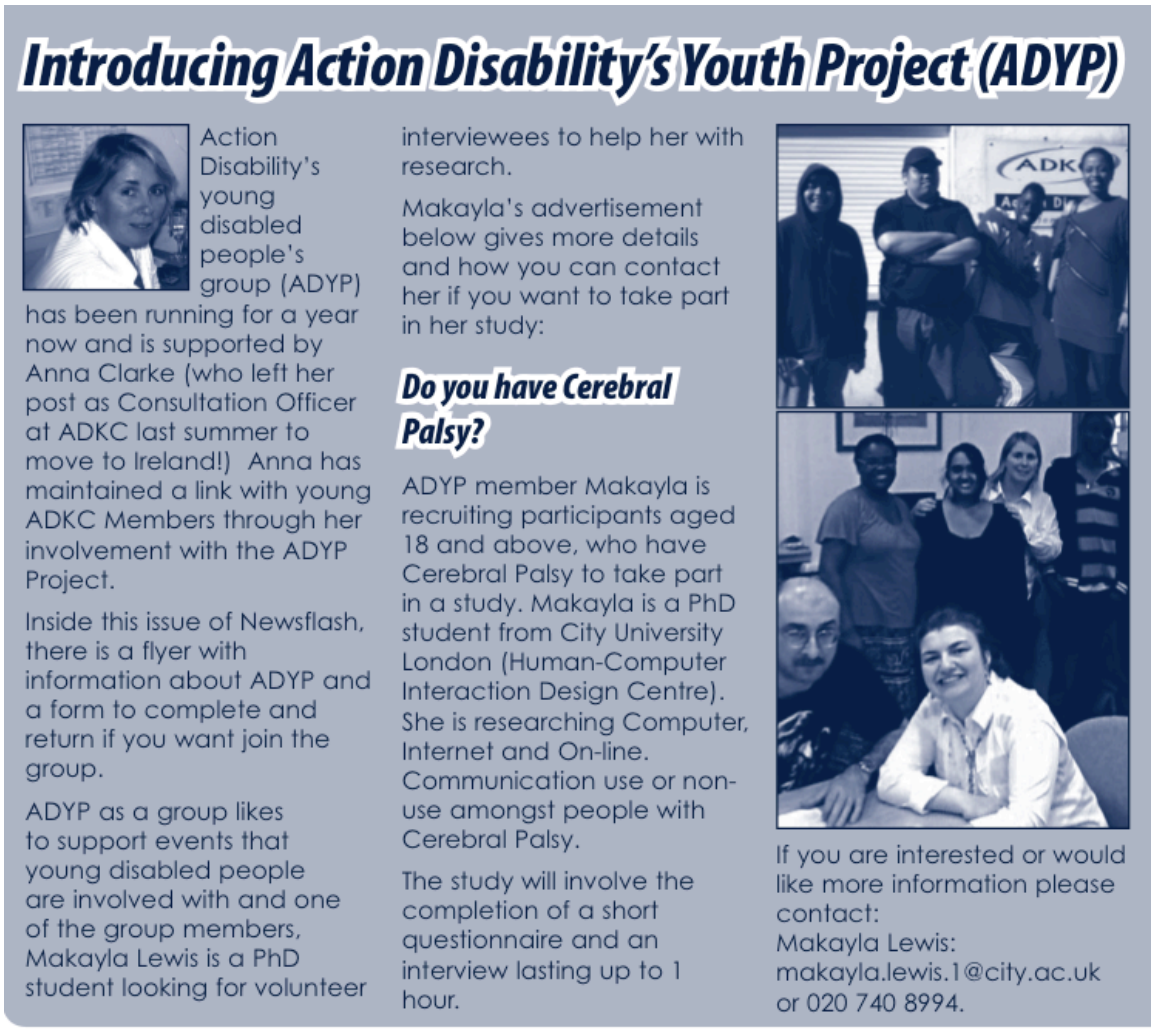


Figure 8. Action Disability Kensington and Chelsea Newsletter placed my advertisement within the Action Disability Youth Project section. The advertisement introduced the study and myself to the RBKC cp community. (copyright has been granted)

3.3.2 Potential participants

The participants were asked to complete a pre-interview questionnaire (see appendix a section a.1.3). The questionnaire was divided into four sections: personal particulars (i.e. City University London affiliation, gender and age range); disability particulars (i.e. cp type and aids and/or assistive technologies used); study particulars (i.e. computer, Internet and online communication use status);

and study availability (i.e. date and time preference). The questionnaire was completed either in person or via telephone, post and email.

The selection criteria was based on responses provided by participants. Exclusion occurred if the potential participant indicated they were under the age of 18 and/or did not have cp. One potential participant was excluded from the study due to being aged under 18. Thus sampling rate was 93.3% and it is believed that participants represented the cp population because multiple versions of the disability are observed among participants (see table 4). Upon accepting participants the interview was booked.

The participants were interviewed individually, however, there were instances where the participant's support individual was present. The interviews were carried out at City University London, Action Disability Kensington and Chelsea (ADKC), West London Connexions centre, University of Coventry and at participant's homes (see Figure 23).

The interviews lasted from 22 minutes to 2 hours 33 minutes and were completed either as one session or two sessions. All participants responses were audio and video recorded.

Figure 9. Multiple interview environments were used: a) City University London, Centre for HCI design focus room, b) University of Coventry interaction lab, c) Action Disability Kensington and Chelsea office, and d) at a participant kitchen table**.**

3.3.3 Semi-structured questionnaire

The interviews were semi-structured, and participants were asked between 4 to 19 questions. The questions referred to their computer use, Internet use, online communication use and offline communication use (see figure 24). The following questions were asked:

COMPUTER USE

1. Do you use a computer? (If so, where, when and computer specifics)
2. Why are you not using a computer?
3. Do you require help to use a computer? (If so, describe)
4. Describe what you did the last time you used a computer?
5. Did you experience any problems when you last used a computer? (If so, describe)
6. How has the way you use a computer changed in the last 6 months?

7. How would you like to use a computer?

INTERNET USE

1. Do you use the Internet? (If so, where, when and browser specifics)
2. Why are you not using the Internet?
3. What websites do you frequently visit and why?
4. How has the websites you visited changed over the last 6 months?
5. Describe what you did the last time you used the Internet?
6. Did you experience any problems when you last used the Internet? (If so, describe)
7. How would you like to use the Internet?

OFFLINE COMMUNICATION USE

1. How do you communicate with friends and family offline?

ONLINE COMMUNICATION USE

1. Do you use the online communication? (If so, where, when and websites or tools used)
2. Why are you not using online communication?
3. Why do you use online communication?
4. Describe what you did the last time you used online communication?
5. Did you experience any problems when you last used online communication? (If so, describe)
6. What are the positive and negative aspects of using online communication?
7. How would you like to use online communication?

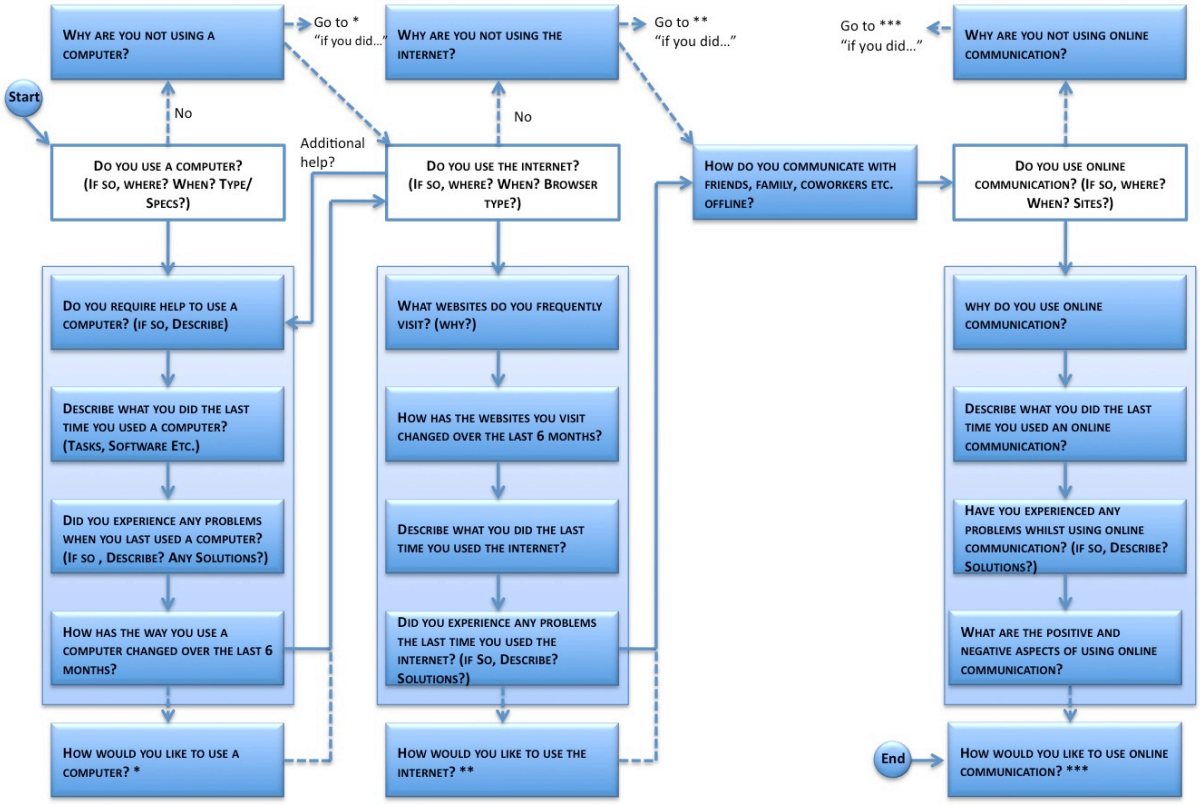


Figure 10. Interview sessions began with 'Do you use a computer?' the participants response to this question determined the next question and so on.

3.3.4 Protocol

The following protocol was followed:

1. Participant and researcher arrived at the interview location.
2. Researcher provides background information about the study to the participant. Researcher also provides the participant with another copy of the Explanatory Statement for Participants (see appendix a section a.1.5). The first copy was given during recruitment.
3. Researcher asks participant to read and give consent[7] (see appendix a section a.1.6).
4. Researcher gives the participant the opportunity to ask questions.
5. The audiotape and videotape recorders are checked and a voice test is carried out.

[7]Participants were asked to sign and date the adult participant consent form. There were instances were participants understood the adult participant consent form but were unable to provide a written signature. In these instances the researcher verbalised the form to the participants
. On completion of the verbalisation the participants were asked to state their name, give consent and state the date consent was given.

6. Researcher starts the audiotape and videotape recordings.
7. The researcher commences the interview, following the guided-interview structure (see figure 24)
8. (If necessary) the researcher takes handwritten notes.
9. On completion of the interview the researcher terminates the audiotape and videotape recordings
10. Researcher identifies any action(s) to be followed up[8]
11. Researcher thanks the participant for participating.
12. Participant (or researcher) leaves the interview location

3.3.5 Apparatus and materials

The following apparatus and materials were required to carry out each interview:

APPARATUS was set up similarly at each interview location:

- Video camcorder
- Video camcorder tapes (one for each interview)
- Tripod
- Digital camera
- SDHC digital camera storage card
- Dictation machine
- Black pen.

[8] The actions followed up were: 1) instances where the interviews were divided into two sessions the date and time for the next session was discussed; and 2) instances where participant requested specific material for example charity information, the researcher and participant discussed what was required and it would be delivered.

MATERIALS

- Participant covering letter (see appendix a section a.1.2)
- Explanatory statement for study participants (see appendix a section a.1.5)
- Adult informed consent form (see appendix a section a.1.6)
- Adult informed consent form for support individuals (see appendix a section a.1.7)
- Pre-interview questionnaire (see appendix a section a.1.3)
- Post-interview notes sheets (see appendix a section a.1.8)
- Recruitment A5 sized flyer, this was a smaller version of the poster (see appendix a section a. 1.1)
- Interview questions structure

3.3.6 Participants

Fourteen participants demonstrating varying forms of cp, requiring different support and assistive technologies (see table 4) and with different computer, Internet and online communication experiences (see table 5) were interviewed.

ID	Participated interview study before	City Affiliated	Gender	Age Range	Cp Type	Use Aids or Assistive Technology
MS01	Yes	No	Female	40-60	Spastic Monoplegia	Sticks
						Splint
						Wheelchair
						Large keyboard
						Computer Mouse
MS02	No	No	Female	18-25	Athetoid Double-Hemiplegia	Wheelchair
						Speech Machine
						Ez Keys
						Head Switch
						Personal Assistant
MS03	No	No	Female	26-30	Spastic, Ataxic Hemiplegia	Stick
						Walking Frame
						Wheelchair
						Personal Assistant
						Computer Mouse
MS04	No	No	Male	18-25	Spastic and Athetoid Double-Hemiplegia	None
MS05	No	No	Male	18-25	Athetoid Hemiplegia	None

MS06	No	No	Female	18-25	Spastic Triplegia	Wheelchair
						Walking frame
						Screen Reader
						Pointer
						Large keyboard
						Computer Mouse
						Personal Assistant
MS07	No	No	Female	31-39	Spastic Monoplegia	None
MS08	Yes	No	Male	18-25	Spastic Quadriplegia	Wheelchair
						Screen Reader
						Voice Recognition
						Personal Assistant
MS09	Yes	Yes	Female	31-39	Spastic & Ataxic Diplegia	None
MS10	No	No	Female	40-60	Spastic Tetraplegia	Wheelchair
						Walking frame
						Sticks
MS11	No	No	Female	18-25	Ataxic Quadriplegia	Wheelchair
MS12	No	No	Male	40-60	Spastic	Sticks
						Walker
						Wheelchair
MS13	No	No	Female	31-39	Spastic	Wheelchair
						Personal Assistant
MS14	No	No	Female	40-60	Spastic	Sticks
						Personal Assistant

Table 4. Factual participant data taken from pre-interview questionnaire.

Participant ID	**Do you use a computer?**	**Do you use the Internet?**	**Do you use online communication tools?**
MS01	Yes	Yes	Yes
MS02	Yes	Yes	Yes
MS03	Yes	Yes	Yes
MS04	Yes	Yes	Yes
MS05	Yes	Yes	Yes
MS06	Yes	Yes	Yes
MS07	Yes	Yes	Yes
MS08	Yes	Yes	Yes
MS09	Yes	Yes	Yes
MS10	No	No	No
MS11	Yes	Yes	Yes
MS12	Yes	Yes	Yes
MS13	Yes	Yes	Yes
MS14	Yes	Yes	Yes

Table 5. Factual participant use data, pertaining to online communication, Internet and computer use.

3.3.7 Organisation of data

3.3.7.1 Data cleaning

The fourteen interviews were transcribed verbatim. The audio recordings were primarily used but there were instances where the video recordings were used to assist the process because the interviewee and or interviewer voice was poorly recorded[9]. The raw data files were presented in a common format for example .doc files, margin of 2.0 respectively, font: Times New Roman, font size: 10. Additionally each participant was given a unique identifier, participants responses were highlighted, and line numbers added (see figure 25).

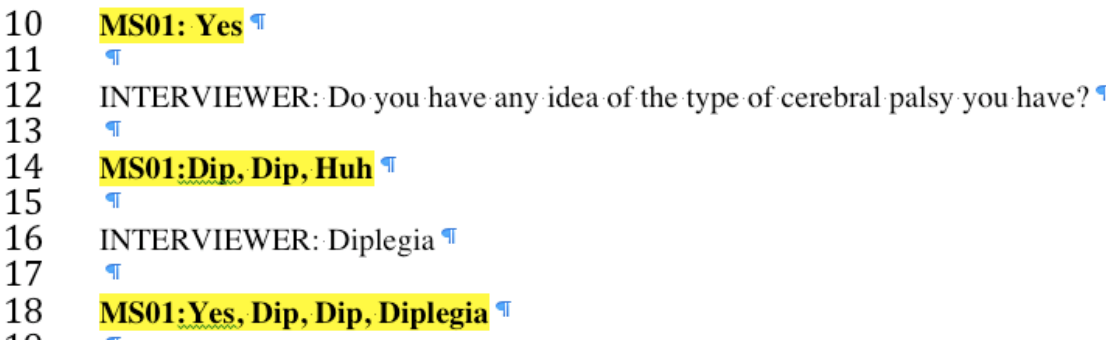


Figure 11. Example of the common format used in all .doc transcription files.

3.3.7.2 Close reading of text

To assist close reading of the text user profiles for each participant were developed. These 4-page documents (see figure 26 to 23) provided a glimpse at "how much experience users [with cp] have with computing or a particular piece of software [computers, the Internet and online communication], the type of physical limitations they have, how frequently they perform common tasks" (Foraker Design, 2010). This structure was used to illustrate participants individual differences, specifically their user experience level, user preferences and variation in ability (Foraker Design, 2010). This structure also included a common HCI method known as Personas (Usability.gov, date unknown) where real names and pictures were not used. Fourteen personas were developed using verbatim

[9] This was attributed to environment interference for example a caregiver vacuum cleaning in a neighbouring room, interruptions for example an individual talking loudly in the background or walking into the interview space and commencing a conversation, or participant disability i.e. his/her impaired speech.

transcripts from each participant interview (see appendix a). The personas were used to understand the comments provided by participants during their interviews. The persona documents were divided into two areas:

1. TOP AREA summarised the participants particulars (gender, affiliations, age range and cp type), their technology use status and required support and or assistance
2. BOTTOM AREA divided into four sections:
    1. ATTRIBUTES participants use specifics for example when and where they used the technology,
    2. BACKGROUND participants history of using the technology,
    3. CURRENT USE how the participants used the technology,
    4. PROBLEMS issues that occur while participants use the technology.

The following user profile examples are based on interview data although the names and photographs given are fictional.

Figure 12. Page 1 (Example) Summary of computer, Internet and online communication use for participant MS01.

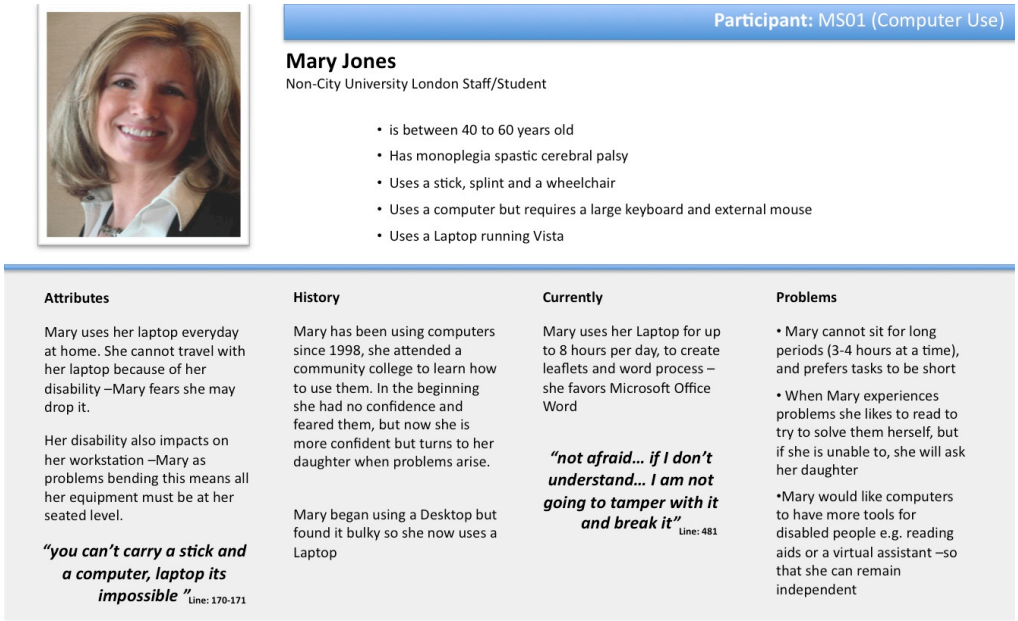


Figure 13. Page 2 (Example) computer use for participant MS01.

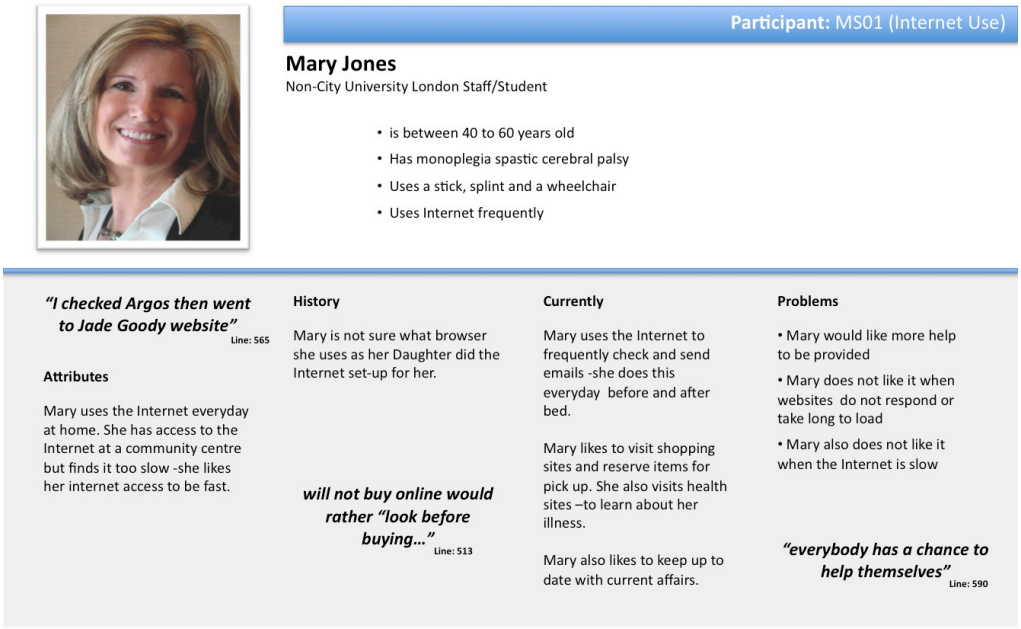


Figure 14. Page 3 (Example) Internet use for participant MS01.

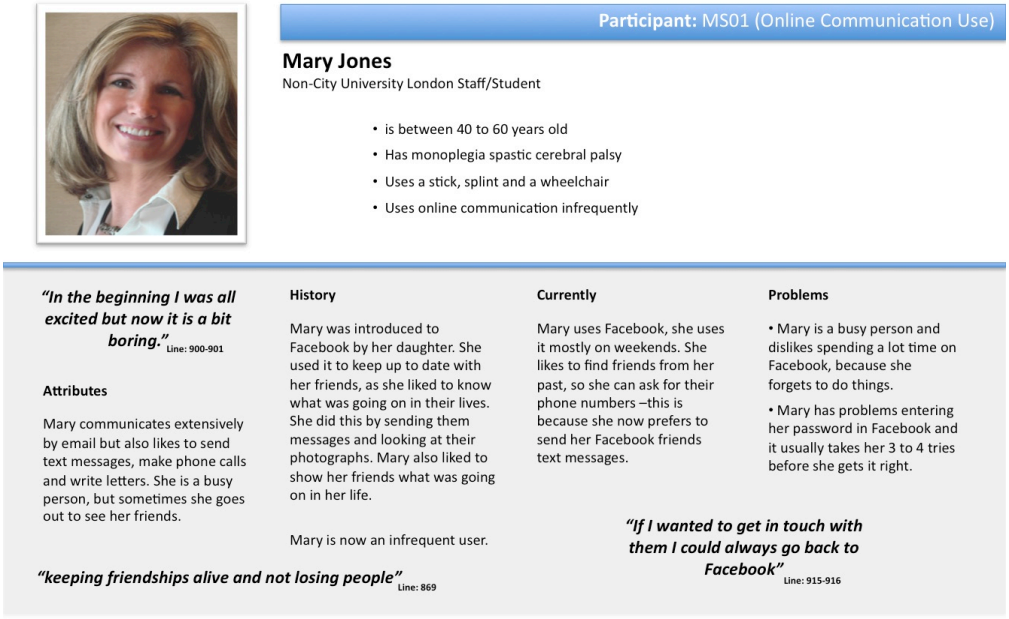


Figure 15. Page 4 (Example) online communication use for participant MS01.

Participant: MS02 (Summary)

Sarah Clarke

Non-City University London Staff/Student

- is between 18 to 25 years old
- Has athetoid cerebral palsy with variable muscle tone
- Uses a wheelchair and a communication aid. She also has a full time personal assistant
- Uses her computers, the Internet and online communication frequently

"...used to come home very sad because people don't communicate with [her] and ignoring [her]..."

Line: 569-570

Attributes

Sarah uses her computers everyday at home. She has a Desktop and a Laptop. Her disability means she cannot use her computer without assistive technologies.

Sarah has access to and uses the Internet everyday, she spends 5 to 6 hours per day using online social networks and sending emails and instant messages as these are the easiest ways for her to communicate.

"my first priority is that I want to do it myself"

Line: 64

History

Sarah has used her communication aid and assistive technologies for the last 7 years. They have allowed her to use her computers independently. Due to Sarah's disability she cannot telephone or text message her friends or family members, so now opts to use the Internet to independently communicate and organize her day-to-day activities.

Currently

Sarah uses her Desktop for non-socializing tasks e.g. doing school work and downloading music and movies, and a Laptop to socialize with friends and family. She uses Facebook everyday to find out what people are up to, via: mail, wall posts, photographs, newsfeed comments and applications. She also uses it to organize events and meetings. Privacy is important to Sarah, she wants to have control of her profile page and her friend lists and she favors Facebook because it gives her this and also independence.

Problems

- Sarah dislikes downloading assistive technology software as it can slow down her computers and website downloads.
- Sarah would like mail confirmations when sending messages to friends on Facebook.
- Sarah dislikes it when Facebook changes the interface as it makes it difficult to use
- Sarah would like to see her profile the same way people on her friend lists see it.

Future

Sarah is looking forward to buying her new communication aid as it will give greater control of her computers, the internet and her immediate environment.

Figure 16. Page 1 (Example) Summary of computer, Internet and online communication use for participant MS02.

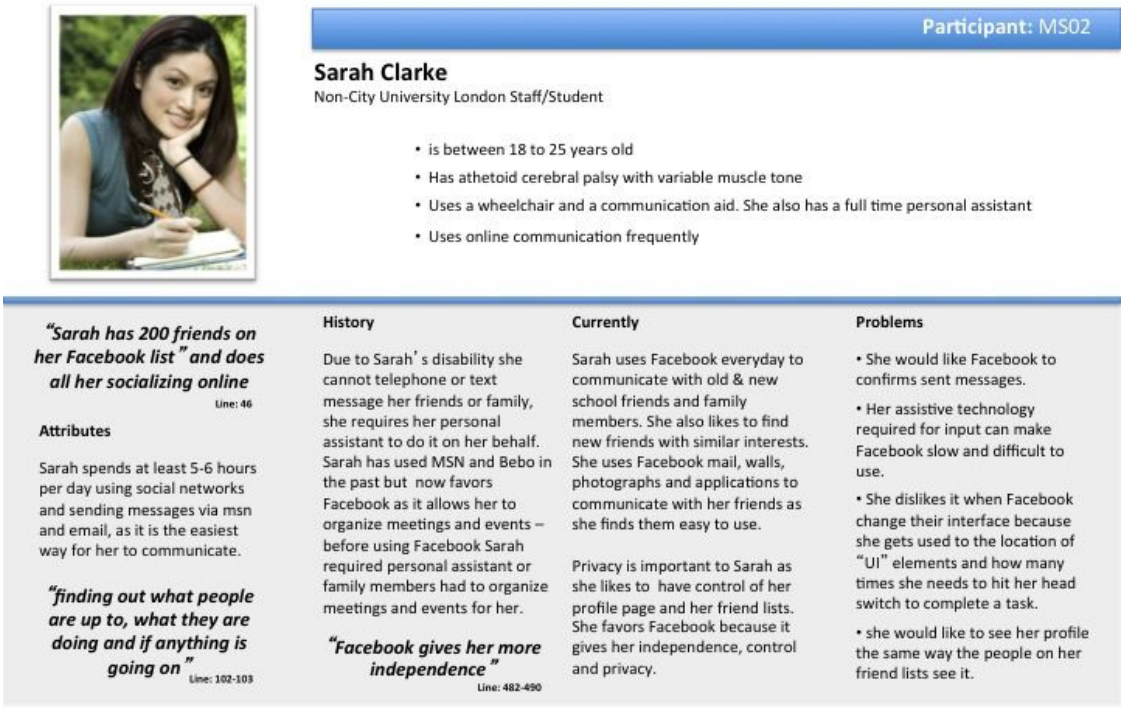


Figure 17. Page 2 (Example) computer use for participant MS02.

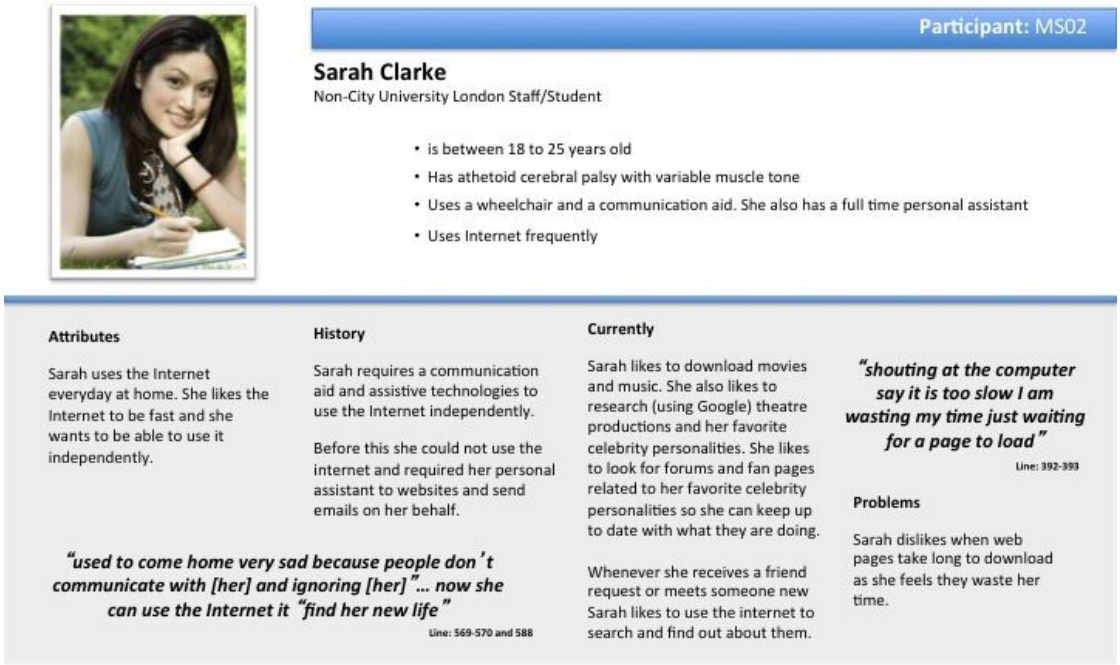


Figure 18. Page 3 (Example) Internet use for participant MS02.

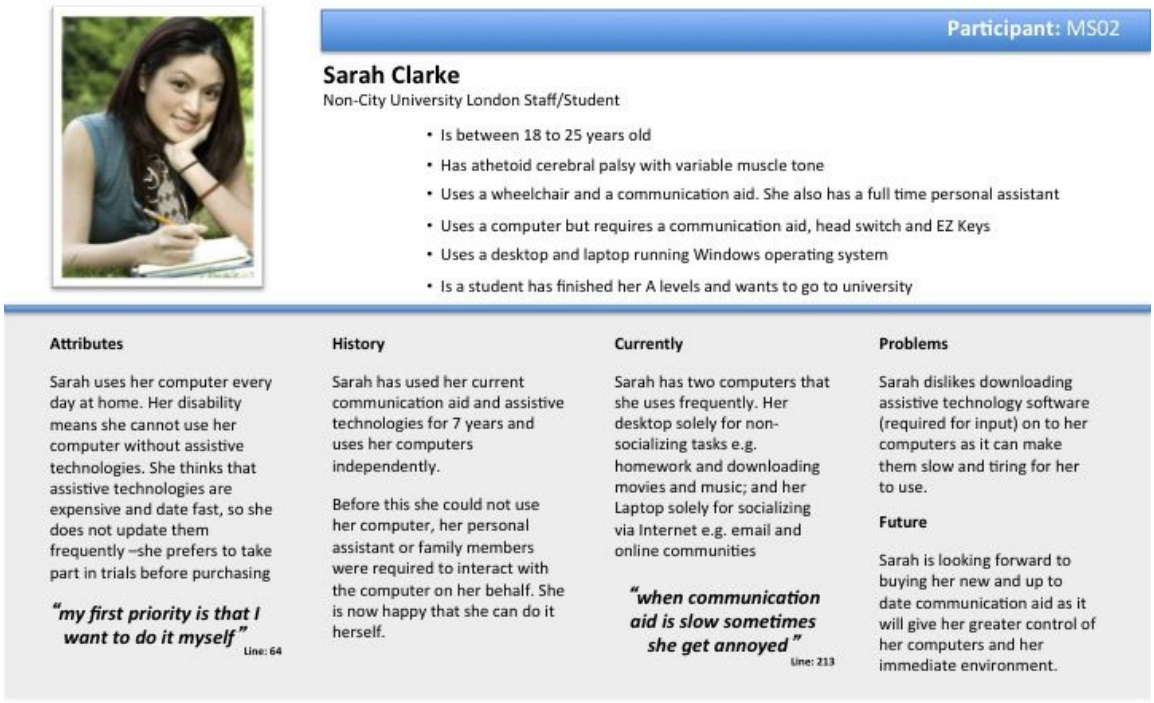


Figure 19. Page 4 (Example) online communication use for participant MS02.

3.3.7.3 Creation of categories

The interviews were coded using general inductive approach (GIA). They were coded as text units i.e. a sentence in the interview transcription. Qualitative analysis software (Atlas.ti version 6.0) was used to code the text units.

The upper-level categories were identified and defined (see table 7) to provide an overview of each text unit for example computer use. This was followed by lower-level categories, for example offline task, which were added to the category list and re-coded across all text units (see table 8).

No.	Category	Description
1	Cerebral palsy Issues	Verbal units where reference is made to the users cp condition. Includes limitation(s) and disability problem(s) or suggestion(s) to resolve them.
2	Computer use	Verbal units where reference is made to computer related tasks.
3	Internet use	Verbal units where reference is made to internet related tasks. Does not include online communication websites, tools or services.
4	Online communication use	Verbal units where reference is made to online communication related tasks.
5	Computer Issues	Verbal units where reference is made to computer problems and suggestions to solve them.
6	Internet issues	Verbal units where reference is made to Internet problems and suggestions to solve them.
7	Online communication issues	Verbal units where reference is made to online communication problems and suggestions
8	Specifics technology use	Verbal units where reference is made to location and time of day when a technology is used.
9	Help	Verbal units where reference is made to help required when using technology. Includes assistive technology, mobility aid and support and assistance.
10	Offline communication use	Verbal units where reference is made to offline communication tasks or technology.
11	Positive online communication use	Verbal units where reference is made to positive aspects to using online communication.
12	Negative online communication use	Verbal units where reference is made to negative aspects to using online communication.
13	Future Technology Use	Verbal units where reference is made to how the technology would like to be used in the future.

Table 6. Upper-level categories.

No.	Category	Description
14	Technology [Computer, Internet or Online Communication] background	Verbal units where reference is made to past use of technology.
15	Technology [Computer, Internet or Online Communication] specification	Verbal units where reference is made to technology specifics for example operating systems, browsers, hardware etc. used by the user.
16	Reason for technology [Computer, Internet or Online Communication] use	Verbal units where reference is made to why technology are used or not used
17	Online tasks	Verbal units where reference is made to attempted or completed on-line task(s).
18	Offline tasks	Verbal units where reference is made to attempted or completed off-line task(s).

Table 7. Lower-level categories. These categories 14-16 will not be used in the final model as they are not representative of each technology.

3.3.7.4 Overlapping coding and un-coded text

There were many text units that were coded into more than one category for example "INTERVIEWEE_PA: so sometimes she used to get the carer to send text messages". This example was categorised under offline communication and "Help" assistance & support. These overlaps were regularly reviewed as categories were added or removed from the category list. Since GIA allows overlapping (Thomas, 2006) most multi-categorised text units were left in place . Additional categories 'off topic' (verbal units where reference is made to topics that strayed away from the interview schedule) and 'interview instructions' (verbal units where reference is made to study instructions) were also coded.

3.3.7.5 Continuing revision and refinement of category system

All categories and their associated text units were searched for emerging categories (see table 9). This ensured the study questions (see section 3.2) were answered and relevant insights were discovered. For example the sub-topic 'change' (verbal units where reference is made to technology change) was identified. Participants reported that changing websites were inconvenient for example "another thing I forgot to tell you when you go on hotmail the thing what's annoying they constantly change it". As the searching process continued lower-level categories were further refined to each technology type (see table 10). These categories had similar meanings to the original upper-level category but allowed for a separation of theme. For example "specific technology" was refined to "specifics" computer, "specifics" Internet and "specifics" online communication.

No.	Category	Description
19	Change	Verbal units where reference is made to technology change. Includes examples, problems and suggestions to solve them.
20	Confidence	Verbal units where reference is made to user confidence when using Technology. Includes positive brief and apprehension.
21	Control	Verbal units where reference is made to control. Includes the control of technology and the control of task completion
22	Environment	Verbal units where reference is made to the users environment. Includes the technology context of use and personal environment
23	Independence	Verbal units where reference is made to user independence. Includes examples, problems and suggestions to solve them.
24	Privacy	Verbal units where reference is made to privacy when using technology. Includes change examples, problems and suggestions to solve them/
25	Safety	Verbal units where reference is made to users safety.
26	Security	Verbal units where reference is made to technology security. Includes task security and users perceived security when using technology
27	Speed	Verbal units where reference is made to speed. Includes speed of the technology and task completion speed.
28	Trust	Verbal units where reference is made to trust. Includes users perceived trust when using Technology and personal outbound trust of others.

Table 8. Emerging categories

No.	Category	Description
29	“Specifics” computer use	Verbal units where reference is to the location and time of day when computers are used.
30	“Specifics” internet use	Verbal units where reference is to the location and time of day when the internet is used.
31	“Specifics” online communication use	Verbal units where reference is to the location and time of day when online communication is used.
32	“Help” assistive technology	Verbal units where reference is made to assistive technology used.
33	“Help” assistance & support	Verbal units where reference is made to assistance and/or support required using technology. Includes computer-based help and physical help for example personal assistant or training scheme.
34	“Help” mobility device	Verbal units where reference is made to a users use of mobility device(s)
35	“Future" computer use	Verbal units where reference is made to how computers would like to be used in the future.
36	"Future" internet use	Verbal units where reference is made to how the Internet would like to be used in the future.
37	"Future" online communication use	Verbal units where reference is made to how online communication would like to be used in the future.
38	"Background" Computer	Verbal units where reference is made to past use of Computer.
39	"Background" Internet	Verbal units where reference is made to past use of the Internet.
40	"Background" Online Communication	Verbal units where reference is made to past use of Online Communication.
41	“Reason” for Computer Use	Verbal units where reference is made to why Computers are used or not used
42	“Reason” for Internet Use	Verbal units where reference is made to why the Internet is used or not used.
43	“Reason” for Online Communication Use	Verbal units where reference is made to why Online Communication is used or not used.
44	"Specification" Computer	Verbal units where reference is made to information about Computer specifics.
45	"Specification" Internet	Verbal units where reference is made to information about Internet specifics.
46	"Specification" Online Communication	Verbal units where reference is made to information about Online Communication specifics.

Table 9. Refined lower-level categories[10]

3.3.7.6 Category model

It was deemed inappropriate to create a category model that encompasses the entire study which consisted of eight or fewer categories as this would not fully answer the study questions (Thomas, 2006). Therefore the study was divided into 4 parts: computer use, Internet use, online communication use, and offline communication use. The category model developed illustrates this division:

[10] Text within the quotation marks reference the category originality for example “specification” online communication originates from Technology Specification. Text outside the quotation mark reference the category relation for example “specification” online communication relates to category online communication

PART 1: COMPUTER USE

Upper/Lower-Level Categories:	Computer issues
	"Specifics" computer use
	"Reasons" for computer use
	"Future" computer use
	"Help" assistive technology
	"Help" assistance and support
	Offline tasks
Emerging Categories:	Independence
	Speed

PART 2: INTERNET USE

Upper/Lower-Level Categories:	Internet issues
	"Specifics" Internet use
	"Reasons" for Internet use
	"Future" Internet use
	"Help" assistive technology
	"Help" assistance and support
	Online tasks
Emerging Categories:	Independence
	Change
	Speed

PART 3: ONLINE COMMUNICATION USE

Upper/Lower-Level Categories:	Online communication issues
	"Specifics" online communication use
	"Reasons" for online communication use
	"Future" online communication use
	Positive online communication aspects
	Negative online communication aspects
	Online tasks

Emerging Categories:	Control
	Privacy
	Independence
	Change

PART 4: OFFLINE COMMUNICATION USE

Upper/Lower-Level Categories:	Offline communication use
	"Help" assistance and support N/A
Emerging Categories:	Privacy
	Independence

Due to the exploratory nature of this study, i.e. its focus on reporting participants experiences rather than the category frequencies (see appendix b section b.1.1 for primary-documents table) and Fleiss Kappa common mathematical difficulties (Foster et al*,* 2008) that include:

- Coder's interpretations of the text causing a different set of codes to be assigned by different coders,
- Coder's operating subconsciously with a reduced set of codes rather than exploring the whole set of possible codes provided,
- Number of codes (especially in this case $n = 25$) effecting the ease of inter-rater reliability calculations i.e. the greater the number, the easier it is for another rater to choose a different category.

Therefore trustworthiness of the category model was not checked.

3.4 Findings

The upper-level categories: computer, Internet, online communication and offline communication use were used as main headings to report the findings. The refined upper-level and lower-level categories such as specific use, reasons for use, reasons for non-use, issues and help were used as sub headings

and the sub-topics for example speed, privacy control etc. are discussed throughout (see appendix b section b.1.1 for the primary-documents table and appendix b section b.1.2 for sample data).

3.4.1 Computer use

Thirteen of the 14 participants interviewed reported having access to and using a computer. This section discusses: specific use (where and how long computer use is carried out), reasons for use (purpose of computer use), reasons for non-use, issues (problems faced during computer use), help (AT device and support required to use a computer), and future use (how people with cp would like to use a computer). It then discusses the sub-topics i.e. speed and independence.

3.4.1.1 Specific use

Describes where and how long adults with cp use their computers. Thirteen of the 14 participants interviewed had access to and used computers regularly. Most of the participants use their computers everyday for a considerable amount of time. Use was carried out at home or their place of work and or education. Four of the participants interviewed described:

> **Example 1:**
>
> "INTERVIEWEE: I try and use it everyday … I would use it for up to four hours that is four hours in the morning and four hours at night."
>
> **Example 2:**
>
> "INTERVIEWEE: Everyday all day… I am on it everyday yeah all day yeah somehow I am on it all day unless I have a hospital appointment"
>
> **Example 3:**
>
> "INTERVIEWEE_PA: you use them a lot don't you?
>
> INTERVIEWEE: yes
>
> INTERVIEWEE_PA: when you get up in the morning its the first thing you do…"
>
> **Example 4:**

"INTERVIEWEE: I using it at university urr the place where I'm working … here in the UK at home"

Some of the participants said they did not travel with their computers outside the home and will often use open access computers. Six of the participants interviewed described:

Example 5:

"INTERVIEWER: where do you use your laptop … do you travel around with it?

INTERVIEWEE: oh no … just in case I drop it … because I use two sticks and I can't carry a laptop"

Example 6:

"INTERVIEWER: do you move around your home sometimes with it?

INTERVIEWEE: I use my trolley to move it"

Example 7:

"INTERVIEWEE: I use the computer anywhere I can"

Example 8:

"INTERVIEWEE: Use university computer it's a open access PC"

Example 9:

"INTERVIEWEE: Sometimes when I'm going to Bulgaria I'm using it there or I'm going in umm particular conference."

Example 10:

"INTERVIEWER: when you are at ADKC[11] have you ever used the computer there?

INTERVIEWEE: [nod once]"

[11] ADKC (Action Disability Kensington and Chelsea) is user-led community centre for disabled residents.

3.4.1.2 Reasons for use

Describes the tasks adults with cp carry out when using computers, it also describes the reasoning behind their use. Most of the participants use their computers for online tasks for example "I used to use Word but now I email people". However participants reported using their computers occasionally to write letters, play games for example football, trains and chess, complete educational work for example essays using Microsoft Word, PowerPoint and sometimes Excel. Some participants also enjoyed watching DVD's, listen to music and organise, edit, personal photographs. Seven of the participants interviewed described:

Example 1:

"INTERVIEWEE: I done a leaflet …

INTERVIEWER: do you handwrite them or do you

INTERVIEWEE: oh no I use Word… because I can type it and save it so its just easier…"

Example 2:

"INTERVIEWEE: I don't like to play games I write sort of word documents and other things … I don't like using PC for games it feels wrong … they are just not build for games PCs"

Example 3:

"INTERVIEWEE: I like to watch films… I and put DVD's in"

Example 4:

"INTERVIEWEE: I am working on my umm for my PhD I was using PowerPoint"

Example 5:

"INTERVIEWEE: I use PowerPoint to do presentations and stuff and very occasionally excel to do a spreadsheet … I often use PowerPoint to do hmm prepare lecture notes or whatever you know and sometimes I use sort of digital imaging or photos or if I am searching for images I get cropped photos or you know its on the software … Photoshop I can use it but very basically … I occasionally use Dreamweaver… and Flash hmm very occasionally… and play train games."

Example 6:

"INTERVIEWEE: Occasionally on my laptop I do play football."

Example 7:

"INTERVIEWEE: If I am in university I need to do essays and I am a model competitive Chess player so I have tools to help me study the game of Chess".

3.4.1.3 Reasons for non-use

Describes why adults with cp do not use computers. One of the 14 participants reported not using a computer. This non-use was due to access and confidence, the participant did not have access to a computer at home and was not confident to ask for help at their local community centre. The participant interviewed described:

Example 1:

"INTERVIEWEE: I do not have a computer at home and I don't go out much … They have this Internet thing around the corner at the centre but I don't know how to use one and I don't want to be a annoying … I would like to know how to though."

3.4.1.4 Issues

Describes the problems faced by adults with cp while using their computers. Participants discussed a variety of issues most were software-based. For example Windows Vista's instability, malfunctioning operating systems and poor user interface features. Three of the participants interviewed described:

Example 1:

"INTERVIEWEE: I don't like laptops I am not really impressed by the laptop I have at the moment as its got vista on it and I don't like vista … it is not stable enough from a computing point of view and the interface is horrible and hmm yea I just don't like it … that big bubble thing they use have hidden all the menus in that and you click on that and it goes down and all the menu items have disappeared they are trying to de-clutter the interface but for people who really liked having all those buttons because I knew what I was doing now I have to search for a piece of function … I guess sometimes I lose track of where I put things and that is due to my difficulties sometimes I lose track of the screen and I can't find a document but that is down to my tracking of my cerebral palsy."

Example 2:

"INTERVIEWEE: Buttons sort of problem I have is were they put all these buttons close together and sometimes the bigger the button the bigger the target area I have to click … there are a lot of people who do struggle with small buttons as well and small target areas"

Example 3:

"INTERVIEWEE: He [computer] a bit grumpy at times and sometimes he [computer] will restart himself without explaining ... yeah with me if my computer breaks down it is an inconvenience"

However hardware-based problems were also reported. Two of the participants interviewed described:

Example 4:

"INTERVIEWEE: DVD compatibility there is not hmm like DVD from America are not compatible with here so you should have a standard you should have a global standard for technology."

Example 5:

"INTERVIEWEE: err the battery goes …

INTERVIEWER: what would happen if that happened?

INTERVIEWEE: it would flash and I don't like it … battery only last for 2 hours … I can't work fast I don't like it"

3.4.1.5 Help and support

Describes the help required for adults with cp to use their computers. Some of the participants required AT devices. One of the participants interviewed described:

> **Example 1:**
>
> "INTERVIEWEE_PA: she uses Pathfinder but will get another version called Liberator … this is what she wants it builds a computer inside and its like the way you use laptop and everything over 90% will fit on the communication aid isn't it? (see chapter 2 section 2.5.1 for definition and further examples)
>
> INTERVIEWEE: yes
>
> INTERVIEWEE_PA: and 20% no 10% will be just the Privilege ... they said that if you download music or movie it will slow down you communication aid so she won't do that she will do that were you desktop or your laptop"

Other participants used lower level AT devices to interact with their computers because they found keyboards and mouse difficult to use for example "I think the keyboards can be hard to use". Eight of the participants interviewed described:

> **Example 2:**
>
> "INTERVIEWEE_PA: when she uses the computer she downloads EZ keys." (see chapter 2 section 2.5.1 for definition and further examples)
>
> **Example 3:**
>
> "INTERVIEWEE: I have that [points to trackball] (see chapter 2 section 2.5.1 for definition and further examples)
>
> INTERVIEWER: do you use that often? I
>
> INTERVIEWEE yes … when I am tired"
>
> **Example 4:**
>
> "INTERVIEWEE: I have a trackball instead of a mouse and I use sticky key function if I need to do two different key strokes I… because I cannot use two hands simultaneously so Stick Jet is a vital bit of software … sometimes it can be difficult the most difficult part of the keyboard

is the function keys because when I am inputting information and I have to keep my write on the key and the functions keys are just out of reach actually I have a piece of kit I don't use a standard keyboard I use a cherry keyboard … because it is half the size of the standard keyboard … because I need it to be able to be able to anchor my wrist … because movement minimum move because I need to get to the keyboard without moving my hands." (see chapter 2 section 2.5.1 for definition and further examples)

Example 5:

"INTERVIEWEE: I have got an external keyboard … because it is easier for me."

Example 6:

"INTERVIEWEE: Windows NOVA control panel … it reads … it lets me hear what is written." (see chapter 2 section 2.5.1 for definition and further examples)

Example 7:

"INTERVIEWEE: Screen reading software is like when I am reading a paper, If I am reading a paper I listen to it through the screen reader instead, I can read but is very slow it takes me about half and hour to read pages … is hard going hmm … so I use screen readers a lot but very occasionally very very occasional I will produce a document using Dragon." (see chapter 2 section 2.5.1 for definition and further examples)

Example 8:

"INTERVIEWEE: Well when I am away from my computer 99.9% I my mouse obviously with my movement I find using using a mouse very difficult so if I can't find ways of doing it on the keyboard rather than a mouse like scrolling downing and up and down on the right I will use a keyboard rather than a mouse if I am using I would have to slow speed right down to in order to be able to use the computer."

Example 9:

"INTERVIEWEE_PA: she can control the word predict" (see chapter 2 section 2.5.1 for definition and further examples)

The study found that AT devices does not always provide the level of help that is required to use a computer. Some participants reported requiring additional help from a support individual, for example, a carer, personal assistant and/or family member. One participant reported asking for help from her

fellow students and is now considering going to her university technical support team. Four participants interviewed described:

Example 10:

"INTERVIEWEE: I don't understand lines so for instance if there's something on a computer so I have to get my [personal assistant] to do something and then I will try and do the same thing."

Example 11:

"INTERVIEWEE: My mum writes letters on the computer and sends them off for me if there is complicated questions on a questionnaire hmm or sometimes she would write letters for me on my behalf she does that as well for me and gives me a copy."

Example 12:

"INTERVIEWEE: Sometimes I have problems with printing yeah this kind of technical issues but yea but sometimes I ask other students but yeah … I am thinking to talk to technical support to help me"

Example 13:

"INTERVIEWEE: Bought a mouse and I didn't know I plug it in the wrong thing … eventually my daughter came and I asked her to fix it and it was fine.

Additionally one participant reported continually asking for help from her daughter was wrong because she wanted to be independent and use the computer for herself. The participant interviewed described:

Example 14:

"INTERVIEWEE: Oh phoning my daughter oh there a problem with the computer and there is nothing wrong with the computer because I am not qualified and I am not don't understand it I should able to you know get on the computer and able to be independent when you haven't get an assistant you are phoning everyone to come and help and I think that is wrong."

However one participant wanted to remain independent as possible by restraining her disability so that she could enter text independently. The participant interviewed described:

Example 15:

"INTERVIEWEE: I go on my computer and do things in my own time because my typing is not so good … I had to type it specially… I would just would as I was typing I would just type some and hmm since my left hand would write I mean type the same word I would so twice then I would write again… it would be longer but I can do it but my typing is slow bit that's that's because of my cerebral palsy."

3.4.1.6 Future use

Describes how adults with cp would like to use computers in the future. This included tasks and potential improvements. Initially participants spoke about the tasks they would like to do. In most instances this was an increase of the tasks they were already doing. Two of the participants interviewed described:

Example 1:

"INTERVIEWEE: Hmm watch more TV … watch movies."

Example 2:

"INTERVIEWEE: I will use endnote quite a lot more because I will start to write my thesis … software for analysing my data … excel, probably I will use different set … software because I will look for search for a job."

Participants then began to discuss future computer improvements. These improvements were linked to increased personal independence via computer-based help. Two of the participants interviewed described:

Example 3:

"INTERVIEWEE: I would like to use a computer in the future it should have more tools for disabled people … like information especially if someone can't read well, and they don't

really know, and there is not like a personal assistant that would rather be independent for them to work without asking anyone … it should be a virtual person so that if they have got enquires they can actually type in ask the person and they should lead them on especially when you have got a disability you want to be independent"

Example 4:

"INTERVIEWEE: I would like it to be helpful … I think a learning program to help … pictures hmm and wording underneath or using number."

Additionally some participants reported task completion speed would be an improvement. Three of the participants interviewed described:

Example 5:

"INTERVIEWER: ok because you don't have a long battery on your computer it would be nice if you could do things a lot faster?

INTERVIEWEE: yes and to type faster."

Example 6:

"INTERVIEWEE_PA: when she uses the computer she downloads EZ keys and of course everything you download is slowing down the computer … and we are shouting at the computer saying it is too slow I am wasting my time just waiting"

Example 7:

"INTERVIEWER: do you like to things fast or do you prefer to do them slow?

INTERVIEWEE: no I don't to do things fast

INTERVIEWER: would you like to do them faster?

INTERVIEWEE: if I could."

It was suggested that one of the ways computers could be made faster was through the use of voice recognition software or touch screen hardware for their text input. Three of the participants interviewed described:

Example 8:

"INTERVIEWER: ... you just want the computer to interpret what you say and write the messages for you…

INTERVIEWEE: [nod twice] …

INTERVIEWER: and that would be easier

INTERVIEWEE: yes."

Example 9:

"INTERVIEWEE: If I could use voice recognition that would help me a lot but the problem with voice recognition you speech would have to be constant regular so with any one with a speech impairment voice recognition is going to be a big issue but the ideal world if I could use voice recognition that is the way I would use it … as you know with cerebral palsy that is the ideal world speech and cerebral palsy isn't in the ideal world"

Example 10:

"INTERVIEWEE: Maybe touch screen touch screen I don't know because even then my dexterity could mean I touch the wrong key."

3.4.1.7 Discussion

The study findings indicated that computer use among adults with cp in this sample was 13. Thirteen of the 14 participants said they had access to and used a computer. All participants reported carrying out use at home or at their place of work or education. Use was carried out most days, 9 of the 13 participants said they used it everyday, and for long periods of time (up to 8 hours). Use was mostly restricted to online tasks, but participants also wrote letters, played games and used Microsoft Office for personal and educational purposes, more rarely participants watched DVD's and played music. This aspect of the study produced results that partially corroborate the findings of previous work in this field. Manna (2005) and Belchiorb et al (2005) looked at computer use among 386 middled aged and older adults with a mean age 77.5. The participants reported having disabilities: 47.1% had fine motor control impairment and 11% had a communication impairment. 98% (aged under 60 years) and 70.7% (aged over 60 years) used a computer at home, 61.7% (aged under 60 years) and 63.5% (aged over 60 years) mainly used their computer for Internet purposes, but only 13.8% (aged under 60 years) and 13.8% (aged over 60 years) used their computer for 7 to 10 hours per week. Whilst 5% (aged

under 60 years) and 15% (aged over 60 years) used their computer for entertainment purposes and 53.3% (aged under 60 years) and 52.8% (aged over 60 years) used it for hobbies. The study does not specify the types of tasks, making the reasons for use hard to interpret.

A questionnaire by Pell (1999) that involved 65 technology users with physical disabilities reported 75% used a computer for up to 25 hours per week. However, the study did not identify why they used computers. Kaye (2000) survey study involving 2,196 participants with disabilities found that 23% (aged 15 years and above) 32% (aged 15-64 years) and 10.6% (aged 65 years and above) had a computer. Pilling (2006) further supported these findings. The study found that 32% of people aged less than 60 years with disabilities owned a computer. However Kaye (2000) and Pilling (2006) do not specify if these users use their computers or the reasons why they carry out use.

Another important finding was that computer non-use among adults with cp in this sample is low (only 1 of the 13, 7.6%) due to non-ownership and the inability (lack of confidence) to ask for help at the local community centre. This aspect of the study produced results that did not corroborate the findings of previous work in this field. Manna (2005) and Belchiorb et al (2005) reported that 281 non-computer users reason for non-use was attributed to cost. Only 10% (aged under 60) and 9.2% (aged over 60) chose access as a reason for not using computers. A lack of confidence to ask for help was not identified. Pilling (2004) reported physical strain as the reason for non-use. However Kaye (2000) inferred 77% (aged 15 years and above) 68% (aged 15 to 64) and 89.4% (aged 65 years and above) do not have access to a computer. Furthermore Pell (1999) implied 25%[12] of people with disabilities are not using computers.

Another important finding was that a variety of issues are faced when adults with cp in this sample use their computers. These include: inconvenience of instability and malfunctioning operating systems, poor user interface features and poor computer battery life. This aspect of the study produced results that did not corroborate the findings of previous work in this field. Neither Manna (2005), Belchiorb et al (2005), Pell 1999), Kaye (2000) and Pilling (2004) have looked at the computer issues experienced.

[12] These values are not explicitly stated but have been deduced from the data provided.

Another finding was that adults with cp in this sample often require help to use their computers. Twelve of the 13 (92.3%) participants reported using an AT devices including ISG's, Half-QWERTY keyboards alongside sticky key function, screen reading software and external keyboards (see chapter 2). The study found that these devices do not always assist use. Some of the participants required help from a carer, personal assistant and/or a family member to carry out use. This aspect of the study produced results that partially corroborate the findings of previous work in this field. Manna (2005) and Belchiorb et al (2005) reported 46.7% (age under 60 years) and 47.5% (age over 60 years) used workstation adaptions. Further to this Pilling (2004) reported 15 out of 65 participants used AT devices. These studies do not specify the type of AT devices, making the devices required to carry out use hard to interpret. However Pilling (2004) survey of 193 people with disabilities reported that two-thirds required AT devices. These included voice recognition (45%), keyboard adaptions (28%), mouse adaptions (24%) and 20% required speech output systems. However, Manna (2005) and Belchiorb et al (2005) identified 36.6% (aged under 60 years) and 38.3% (aged over 60 years) required help from a family member. The study did not identify a requirement for support individuals.

The final important finding was that future computer use is similar to the users current use i.e. adults with cp in this sample would like to increase the tasks they are currently doing such as watching more DVD's. They would also like better computer-based help to increase their independence. They discussed making data input faster and easier, suggesting voice recognition software whilst reporting that they are impossible to use. This aspect of study produced results that do not corroborate the findings of previous work in this field. Manna (2005) and Belchiorb et al (2005) did not report how users would like to use their computers in the future but makes suggestions to make computers easier to use for example large screens (28.4%) and larger keyboard keys (16.7%). Surprisingly the study identified only 3.2% of users felt voice recognition software was difficult to use.

3.4.2 Internet use

Thirteen of the 14 participants interviewed reported having access to and using the Internet. This section discusses specific use: where and how long Internet use is carried out, reasons for use: purpose of Internet use, reasons for non-use, issues: problems faced during Internet use, help: assistive technology, support and or assistance required to use the Internet, and future use: how people with cp would like to use the Internet. It then discusses the sub-topics i.e. speed and change, when the Internet is used.

3.4.2.1 Specific use

Describes where and how long adults with cp use the Internet. Thirteen of the 14 participants had access to and used the Internet regularly. Most of the participants use the Internet throughout the day for multiple hours. Use was carried out at home but also at their place of work and/or education. Seven of the participants interviewed described:

Example 1:

"INTERVIEWEE: oh at home"

Example 2:

"INTERVIEWEE: before I go to bed and when I get up in the morning"

Example 3:

"INTERVIEWEE: she was online everyday"

INTERVIEWEE: yes"

Example 4:

"INTERVIEWEE: like in the evening in the morning or when I go to uni I use it there you know hmm throughout the day really"

Example 5:

"INTERVIEWEE: I was in the office using the Internet"

Example 6:

"INTERVIEWEE: I probably use several hours a day"

Example 7:

"INTERVIEWEE: at friends and family hmm if I am at university I will use it there … all the time constantly"

One participant reported also using the Internet at a community centre but indicated that slow Internet speeds meant use at home was favoured. This participant described:

Example 8:

"INTERVIEWEE: oh yeah yeah I use it at the adventure centre it is a community centre but there internet access is very slow so I would rather do it at home"

3.4.2.2 Reasons for use

Describes the tasks adults with cp carry out when using the Internet. It also describes the reasoning behind their use. As previously discussed most of the participants use their computers for online communication for example "I used to use Word but now I email people". However participants also reported using the Internet to search for health information, education, celebrities, hobbies, jobs, shops, entertainment for example plays and shows, banks and videos. Participants also reported watching TV, listening to the radio and reading books online. Whilst other participants reported booking flights and university rooms. Fifteen of the participants interviewed described:

Example 1:

"INTERVIEWEE: the BBC health site

INTERVIEWER: do you visit health sites a lot?

INTERVIEWEE" no only if I am curious because sometimes the doctor says you go this illness and you may not have it so I would rather read up before I go and visit the doctor to find out whose telling the truth"

Example 2:

"INTERVIEWEE: I went to Jade Goody website"

Example 3:

"INTERVIEWEE: I check my online banking hmm because that is quite good use I catch up on TV that I might have missed I have an interest in trains so I commonly look on the National Rail website like everyday just to see how they trains are doing and everything you know hmm and just general train websites … I check the university hmm and and other A level and GCSE … sometimes I like read the bible online … if I miss church I will listen to some services on the internet"

Example 4:

"INTERVIEWEE_PA: she goes to the hmm see the shows a lot so she does research about the shows

INTERVIEWER: do you mean like theatre?

INTERVIEWEE_PA: no no no like west end shows… she likes house musical so she and if somebody is good looking musical oh differently she goes in it?

INTERVIEWEE: yes

INTERVIEWEE_PA so she usually go online and do research then we come London and we book it through the theatre

INTERVIEWEE: yes"

Example 5:

"INTERVIEWEE: mainly Google … it is the first thing on my list … hmm I think I have hotmail and yahoo"

Example 6:

"INTERVIEWEE: I use YouTube and I love to listen to music"

Example 7:

"INTERVIEWEE: I was looking for a room that I booked online … then I checked the UCL website"

Example 8:

"INTERVIEWEE: I am listening to the radio online"

Example 9:

"INTERVIEWER: do you use other things hmm iPlayer?

INTERVIEWEE: yeah … at the evenings"

Example 10:

"INTERVIEWEE: publish like lecture notes"

Example 11:

"INTERVIEWER: do you use other things hmm iPlayer?

INTERVIEWEE: yeah "

Example 12:

"INTERVIEWEE: Oh, I went to look on Argos I went to see the bargains

INTERVIEWER: do you use Argos quite frequently

INTERVIEWEE: yes … Next

INTERVIEWER: and Next do you purchase stuff online

INTERVIEWEE: yes

INTERVIEWER: how often would you say you do that?

INTERVIEWEE: not often"

Example 13:

"INTERVIEWEE: like shop websites … and just browsing on those websites hmm and shopping as well"

Example 14:

"INTERVIEWEE: I am travelling quite a lot but not that much I need to book urr I mean flight tickets online … I am also buying books over Amazon"

Example 15:

"INTERVIEWEE: job hunting …"

Participants reported shopping and banking online because it was easier and less timely than going to physical shops. Others reported using online shopping to view products and services but would not buy items because they wanted to see what they were buying. Four of participants interviewed described:

Example 16:

"INTERVIEWER: why do you purchase online?

INTERVIEWEE: it is to difficult to carry it sort of and they will deliver it to my house"

Example 17:

"INTERVIEWEE: it is easier than queuing up at banks I don't have the time to do that I don't have time to go and stand in a queue for long"

Example 18:

"INTERVIEWEE: everything is online so I can see what they have and its all online so I don't have to worry about going out and doing it"

Example 19:

"INTERVIEWER: do you buy things online?

INTERVIEWEE: no not really no I don't I would rather look before I buy… I am very fussy when it comes to that"

Additionally participants reported using the Internet for particular tasks related to future events. One participant interviewed described:

Example 20:

"INTERVIEWEE: I use the internet hmm it depends on me if there is something I have to do for the next day I will do it the night before or a week before"

Another participant reported the Internet provided independence especially when shopping because support individuals were not required. This participant described:

Example 21:

"INTERVIEWEE: you can do shopping you can buy food you if the weather is raining you don't have to ask someone to do your shopping"

3.4.2.3 Reasons for non-use

As previously discussed 1 of the 14 participants report not using computers due to lack of access and confidence to ask for help from their local community centre (see section 3.6.1.3).

3.4.2.4 Issues

Describes problems faced by adults with cp while using the Internet. Participants discussed a variety of issues, these included slow Internet speed, poor user interface features for example small text size and unstable and frequently changing websites. Six of the participants interviewed described:

Example 1:

"INTERVIEWEE: the server was very slow and it would just get me annoyed"

Example 2:

"INTERVIEWEE: oh yeah yeah I use it at the adventure centre it is a community centre but there internet access is very slow so I would rather do it at home … I need information I would rather go home and sort out myself cause it is very slow I don't have all day to sit"

Example 3:

"INTERVIEWEE: sometimes I can hardly see at times and even if I did wear glasses I cant see the print so sometimes it is very difficult, if you are on a website and you want to print out the words they are very tiny"

Example 4:

"INTERVIEWER: so the main problem is text such as getting it to a large size

INTERVIEWEE: yes

Example 5:

"INTERVIEWEE: sites cause sometimes you have interference on the site like you can go to the site and it says I am sorry it is not available or it is not responding so I could wait up to 2 to 3 hours before it does respond"

Example 6:

"INTERVIEWEE: change throws me a little bit … if I go on somewhere mean if I go on some bodies website and it may have changed they keep there bit hmm their locations hmm I have to like be ooo there they have changed it ooo it has all moved you know how frequently the university they keep changing there eLearning system it is annoying … I think it is called like Blackboard"

Some participants reported issues interacting with websites especially e-commerce websites and websites requiring password entry due to their fine motor impairments and time restriction prosed. One participant interviewed described:

Example 7:

"INTERVIEWEE: keying in a long credit number … it can take a long time… it is a put off and usually you are given a limited amount of time so if you don't key in you number in about say about 20 seconds it will log you off so speed would be an issue so why to use my debit card so that would be a limitation unless companies realise that people except them could hmm up there problems keying in information … my dexterity is not is not the best is keying in the wrong information hmmm especially if it is a password where you cant see the letter it can be a problem"

Another participant reported disliking the web browser but due to the participant dislike of change they were reluctant to change it. The participant interviewed described:

Example 8:

"INTERVIEWEE: I have got like browsers on my machine web browsers and I keep meaning to change over to Firefox and I just default and go to Internet Explorer … I don't like to change"

3.4.2.5 Help and support

Describes the help required for adults with cp to use the Internet. Participants indicated requiring the same AT devices as discussed in section 3.6.1.6 and 2.4.1. However some participants reported requiring additional AT devices and a support individual to use the Internet. Two of the participants interviewed described:

Example 1:

"INTERVIEWEE_PA: I brought EZ keys and you can see how she connects the software she has she downloads to her computer she can communicate with people online through the switch

INTERVIEWEE: yes" (see chapter 2 section 2.5.1 for definition and further examples)

Example 2:

"INTERVIEWEE: I am searching for things after the Google stage sometimes I need help … I have an assistant"

3.4.2.6 Future use

Describes how adults with cp would like to use the Internet in the future. This included tasks and potential improvements. Participants reported the tasks they would like to do specifically an increase of the tasks they were currently carrying out. One of the participants interviewed described:

Example 1:

"INTERVIEWEE: I would do the same as I do now I would do something online and I would purchase what I need instead of coming out to the shops I so it sometimes but not that often"

Additionally participants then began to discuss using other websites and tools. One of the participants interviewed described:

Example 2:

"INTERVIEWEE: hmm I am not sure whether the Google docs is very useful, I mean in terms of what kind of information I can get when I type certain words not sure hmm also if I cant compare Google and urr common Google and Google Scholar and urr I nee to check both sides you know whether some of the papers or umm data they were different and I just don't think Google is a very good one because I don't think so I can get good things I mean urr data that I can get when I search there urr I don't think they are the right ones"

Finally participants discussed future Internet improvements. They referred to language translation facilities and alternative entry methods. Two of the participants interviewed described:

Example 3:

"INTERVIEWEE: maybe the Internet web pages there could be software that could translate or foreign languages into Standard English"

Example 4:

"INTERVIEWEE: the main thing would be speech control but again with cerebral palsy the ideal is going is the ideal and the expectation are totally inappropriate because with my speech I got hmm with all the good will in the world it is never going to happen"

3.4.2.7 Discussion

The results from the study indicate that Internet use among adults with cp in this sample is 13. Thirteen of the 14 participants said they had access to and used the Internet. All the participants said they carried out use at home and at their place of work or education but also at friends homes. This aspect of the study produced results that corroborate the findings of previous work in this field. Grimaldi and Goette (1999) reported that 36% of people with mobility impairments have broadband access at home. Whilst Manna (2005) and Belchiorb et al (2005) reported 33.3% (aged under 60 years) and 73.6% (aged over 60 years) had a computer with Internet access. Furthermore 61.7% (aged under 60 years) and 63.5% (aged over 60 years) used it to access the Internet. Whereas Pilling (2004) indicated that 73% of people with disabilities used the Internet. Further to this the study reported 84% used the Internet at home, 18% at an educational institution and 7% at a community or voluntary organisation. Manna (2005) and Belchiorb et al (2005) partially supported this suggesting that 98.3% (aged under 60 years) and 70.7% (aged over 60 years) carried out use at home. However Kaye (2000) indicated differently, reporting that 15.8% (aged 15 to 65 years) use the Internet at home, compared to 4.7% (aged 65 and above years) and 15.1% (aged 15 to 65 years) used the Internet.

The findings from the study indicate that adults with cp in this sample use the Internet to find health information, education, celebrities, hobbies, jobs, shops, entertainment for example plays and shows,

banks and videos. The findings indicated that participants also watched TV, listened to the radio and read books. A few participants reported booking products or facilities. This aspect of the study produced results that corroborate the findings of previous work in this field. Kaye (2000) reported people with disabilities used the Internet to search for information (62.8%), news, weather and sports (39.0%), courses and schoolwork (29.3%), job related tasks (26.2%), shop, pay bills etc. (17.0%) and searching for jobs (15.9%). Dobransky and Hargittai (2006) survey of 6584 people with disabilities furthered this, reporting that internet users with disabilities were searching product information (83.5%), getting news, weather or sports information (76.1%), purchasing products or services (50.5%), looking for health information (48.3%), searching for information about government services (46.8%), downloading government forms (32.4%), submitting completed government forms (32.4%), playing games (37.8%), banking online (25.7%), searching for jobs (17.7%), listening to the radio or viewing TV and movies (19.1%), trading stocks or bonds (6.1%), taking a course (5.4%).

Whilst Pilling (2004) reported that people with disabilities were using the internet to find information on goods and services (86%), buy or order tickets/goods/services (40%), personal banking, financial and investment activities (29%), looking for jobs or work (11%), downloading software (31%), downloading or playing music (13%), finding information related to schoolwork or an educational course (40%), using or accessing government official services (36%) and general browsing (62%). Finally, Seymour and Lupton (2004) study that interviewed 35 Internet users with motor impairments (four had report having cp) and visual impairments. The study found that these individuals favored disability related sites regularly to learn more about their condition.

Another finding was that computer non-use among adults with cp in this sample is low (1 of the 13, 7.6%) due to non-ownership and the inability (lack of confidence) to ask for help at the local community centre. This aspect of the study produced results that did not corroborate the findings of previous work in this field. Consumer Expert Group (2009) indicated a lack of awareness of access technology and the challenge of finding the most suitable access technology as reasons for non-use. Whilst Pilling (2004) reported a lack of understanding of the benefits and cost as a reason for non-use.

Another finding was that a variety of issues are faced when adults with cp in this sample use the Internet, these included speed of the Internet, user interface features (for example small text size) and unstable and frequently changing websites. The study also indicated that participants had problems entering text into websites especially e-commerce websites and websites requiring passwords. This aspect of study produced results that did not corroborate the findings of previous work in this field. Pilling (2004) reported that 38% of people with disabilities found most or many sites easy to use and navigate. However the study found that guides to sites, cluttered pages, lots of graphics and advertising, unclear or few links, hard coded colour and print size, poor standardisation, poor search options, and problems with voice recognition were issues that also affected Internet use.

Another finding was that adults with cp in this sample often require help to use the Internet. This help was the same as computer use (see section 3.4.1.5). This aspect of the study produced results that partially corroborate the findings of previous work in this field. Pilling (2004) survey of 193 people with disabilities reported that two-thirds required AT devices that included voice recognition software (45%), keyboard adaptions (28%), mouse adaptions (24%). Additionally one-fifth of respondents required speech output systems.

The final finding was that future Internet use is similar to the users current use i.e. adults with cp would like to increase the tasks they are currently doing. The findings also indicated Internet improvements such as the inclusion of language translation facilities and alternative interaction methods. This aspect of the study produced results that do not corroborate the findings of previous work in this field. Pilling (2004) reported that 47% of people with disabilities would like to use the Internet more but were worried about high online costs.

3.4.3 Online communication

Thirteen of the 14 participants interviewed reported having access to and using online communication. This section discusses: specific use (where and how long online communication use is carried out), reasons for use (purpose of online communication use), reasons for non-use, issues (problems faced

during online communication use), future use, positive and negative aspects of use. It then discusses the sub-topics change, speed, control, privacy and independence.

3.4.3.1 Specific use

Describes where and how long adults with cp use online communication. Thirteen of the 14 participants reported having access to and were using (or have used) online communication. Most of the participants reported using it frequently, up to 6 hours everyday, while others reported infrequent use, restricted to weekends or monthly. As with computer and Internet use, 13 of the 14 participants reported using online communication at home or at their place of work and or education. Eight of the participants interviewed described:

Example 1:

"INTERVIEWEE_PA: minimum of 5 to 6 hours because it is easier way to communicate without any help it keys you more independent doesn't it?

INTERVIEWEE: yes"

Example 2:

"INTERVIEWEE: as much as I can use it"

Example 3:

"INTERVIEWER: any particular time?

INTERVIEWEE: anytime"

Example 4:

"INTERVIEWEE_PA: when you get up in the morning the first thing you do is you check your email and then go to Facebook

INTERVIEWEE: yes"

Example 5:

"INTERVIEWER: when did you use it?"

"INTERVIEWEE: mostly at weekends because most of my friends are working or I was to busy so mostly at weekends"

Example 6:

"INTERVIEWER: how often would you say that was?

INTERVIEWEE: whenever I have the time about once per month … I don't have time to myself I am always out or sometimes job hunting or hospital"

Example 7:

"INTERVIEWEE: … at home it is more personal so I can go on Facebook outside home environment it is not personal enough"

Example 8:

"INTERVIEWEE: I log into the messenger but it depends where I am if I am in university we can have MSN installed on your machines but I haven't got the time to have them do it yet on mine so I have to go through hotmail but if I am at home I will on my desktop or on my laptop I will go through MSN.

INTERVIEWER: how often would you say you used MSN?

INTERVIEWEE: everyday …"

3.4.3.2 Reasons for use

Describes the tasks adults with cp carry out when using online communication. It also describes the reasoning behind their use. As previously discussed most of the participants use their computers for online communication: "I used to use Word but now I email people" making it a key way to communicate. One participant interviewed described:

Example 1:

"INTERVIEWEE: cant socialise without it … it is like food drink she wants to get up first thing in the morning to catch up her emails what you are doing where we going to meet."

The participants reported using five types of online communication: email (mostly hotmail "hmm I check hotmail because I have two email accounts"), OSN specifically Facebook, instant messengers for example MSN Messenger, Google Talk and Yahoo Messenger, video conferencing i.e. Skype and

dating websites. Participants did not report using forums or bulletin boards but one reported subscribing to aviation mail shots[13]: One participant interviewed described:

Example 2:

"INTERVIEWEE: another friend who work in Dublin he sends out mail shots to all aviation people and sometimes I am on his mailing list because of my interests in Irish aviation."

Participants were introduced to online communication by family members or friends "my daughter introduced me to it" and these were the people they predominately communicated with. However participants also reported talking to strangers "some are people I hardly know". Nine of the participants interviewed described:

Example 3:

"INTERVIEWER: ok so you have used Facebook?

INTERVIEWEE: yes you know what I mean, that is it and emails and that is it … oh most of my friends who I communicate are mostly email … yeah sometimes I go out and see them but most of the time I am very busy myself so I mostly email them to make sure they are ok what they are doing … you can see what is going on and they would show you pictures of what they have being doing and you would show what you have being doing"

Example 4:

"INTERVIEWEE: hmm I hmm with my family I am talking over Skype hmm then I am using messenger as well … I am using google google gTalk hmm I prefer to use this kind of things"

Example 5:

"INTERVIEWER: how did you meet those people you hardly know?

INTERVIEWEE: I would search through Facebook and click on people … I find people you know interesting and see if there is any what's the word similarities between people"

Example 6:

"INTERVIEWER: so you meet a lot of you friends through online

[13] A mail shot is defined as a method of advertising by sending material to potential customers through the mail (Oxford, 2009)

INTERVIEWEE: yes”

Example 7:

“INTERVIEWER: ahh so do you use MySpace often?

INTERVIEWEE: no”

Example 8:

“INTERVIEWER: oh so you use dating sites?

INTERVIEWEE: yeah I do”

Example 9:

“INTERVIEWER: you said that you use dating sites do you use them often?

INTERVIEWEE: no no”

Example 10:

“INTERVIEWER: you said that you used MSN

INTERVIEWEE: yes I use that sometimes hmm and I use hmm I use hmm Facebook quite a lot”

Example 11:

“INTERVIEWER: what types of websites do you like to visit?

INTERVIEWEE: hmm hmm Facebook and dating sites”

Thirteen of the 14 participants reported using OSNs, specifically Facebook. They also indicated having larger than average friend lists through they only communicated with few individuals on their friend lists. This was contributed to a reduction in trust among their connections. This decreased their likelihood of searching for new connections. Three of the participants interviewed described:

Example 12:

“INTERVIEWEE: because of the way my life is I find it hard to let people in and trust people because I don’t have hmm I mean I may have 561 friends on Facebook but I have 1 close friend”

Example 13:

“INTERVIEWER: how many people would you say you had as friends on Facebook?

INTERVIEWEE: I think the last time I checked 259

INTERVIEWER: do you talk to them all?

INTERVIEWEE: not all … hmm about 15"

Example 14:

"INTERVIEWER: are you planning on meeting new people on Facebook or just to talk to people you already know?

INTERVIEWEE: I already know"

Further to this some of the participants reported feeling forced to use OSNs because family members and or friends did so. Four of the participants interviewed described:

Example 15:

"INTERVIEWEE: I know that before when I was in Bulgaria I never used Skype or never used this kind of things but when I move in UK I you know I was forced to use all this source of communication because some of my friends they using gTalk because it nicely designed some of them they will use Skype some of them will use messenger and that why I need to force to urr to use all those different king of program"

Example 16:

"INTERVIEWEE: because my friends on it like hmm when I'm bored I get hmm I go on it to see who's online to see if anybody is online so I can chat to them"

Example 17:

"INTERVIEWEE: I have I started with Skype hmm I am kind of not using it because I thought it was c*** because my ex-girlfriend hmm who lived in Wales used Skype I don't really use it I only used it because it was a cheap way of getting in contact with her"

Participants discussed what they used online communication for placing emphasis on OSNs. This included talking to friends via public and private messages, finding out what friends were doing, organising face-to-face meetings, checking notifications i.e. friend and application requests, and using inbuilt chat for example Facebook chat. While other participants reported using applications for example poking and hugs to elicit communication. Nine of the participants interviewed described:

Example 18:

"INTERVIEWEE_PA: finding out what people are up to what they are doing and if anything is going on then she join them … hmm yes writing an email evening meeting if she wants to meet she organise then she let me know she wants to go out then I instead of me informing people to say oh would you like to meet up or do anything … isn't it?

INTERVIEWEE: yes"

Example 19:

"INTERVIEWEE: I use hmm Facebook but I am like hmm hmm browse or to send other stuff to things you can do on Facebook but I don't that's why I hmm

INTERVIEWER: so you just usually use Facebook to find people

INTERVIEWEE: yes find friends

INTERVIEWER: and use your email to contact them

INTERVIEWEE: yes"

Example 20:

"INTERVIEWER: what do you do on Facebook?

INTERVIEWEE: hmm I check who is online and talk to them if no one is there I would hmm check what people have written I will check what people are doing"

Example 21:

"INTERVIEWEE: I logged in I checked that I had no friends request so I found that I had one so I ignored it … I logged to see if I had any friend request and I sent a message to 3 of my friends about the change of my address"

Example 22:

"INTERVIEWEE: I use poking that about all … to give them something nice to say yeah I'm online"

Example 23:

"INTERVIEWER: what would you say was your favourite application on Facebook is?

INTERVIEWEE: hug"

Example 24:

"INTERVIEWER: so when you are talking to them on Facebook how are you talking to them are you using like the mail service or are you using like the poking or the walls?

INTERVIEWEE: yes

INTERVIEWER: do you use all of it?

INTERVIEWEE: yes yes

INTERVIEWER: … how do you find those built in applications? Are they hard to use?

INTERVIEWEE: No

INTERVIEWER: are they very easy

INTERVIEWEE: yes"

Example 25:

"INTERVIEWER: when you use MSN you just text or do you use the emotions?

INTERVIEWEE: emotions … I do them individually and click on them"

Example 26:

"INTERVIEWEE: because my friends on it like hmm I'm bored I get hmm I go on it to see whose online to see if anybody is online so I can chat to them and I just chat and go on it"

The participants reported looking at and commenting on their friends statuses and pictures. This allowed them to discover what they are doing and to elicit communication. However the participants reported rarely updating their own status or uploading photographs because they wanted to keep what they were doing private or they felt their friends would not be interested. Four of the participants interviewed described:

Example 27:

"INTERVIEWER: when you read the newsfeed do you ever tick the thing to that says you liked something?

INTERVIEWEE: no

INTERVIEWER: do you ever comment to people statuses?

INTERVIEWEE: yes"

Example 28:

"INTERVIEWER: how often would you say you do that?

INTERVIEWEE: hardly ever

INTERVIEWER: how often do you do your own status?

INTERVIEWEE: once a month"

Example 29:

"INTERVIEWEE: I have only put a few other ones I don't want people to see all my pictures

INTERVIEWER: you don't want them to see it?

INTERVIEWEE: not all of them

INTERVIEWER: why is there any reason?

INTERVIEWEE: because it is private to me and I don't want people to see all my pictures"

Example 30:

"INTERVIEWER: when you are on Facebook do you use the status say what you are doing

INTERVIEWEE: hmm yes … I used to do it and I stopped … I didn't feel like writing what I what I doing to people"

3.4.3.3 Reasons for non-use

Describes the reasons why adults with cp do not use online communication. One of the 14 participants reported not using online communication. As previously discussed this participant did not use computers or the Internet due to a lack of access and confidence to ask for help, this was also true for online communication use. However some participants reported only carrying out use to aid offline (conventional) communication. One participant interviewed described:

Example 1:

"INTERVIEWER: so you said you used to use Facebook to hmm to find people you haven't found a while and to keep in touch with people do you no longer use Facebook so how are you keeping in touch with these people?

INTERVIEWEE: because I have got there phone numbers and I can text them

INTERVIEWER: oh so you have gone back to your old way of communicating

INTERVIEWEE: yeah"

Other participants reported favouring one type of online communication over others for example two participants preferred email and reported unfamiliarity as a reason for not using other types. Two of the participants interviewed described:

Example 2:

"INTERVIEWER: you mentioned you don't use online communication is their any reason why?

INTERVIEWEE: because I was never used to I mean when I had a particular question I remember once I was looking for information about a test it was umm and because this is not my area I don't know anything this test was search in Bulgaria for an online community when I ask post this question but then didn't go back to get this answer because I found the answer somewhere else but no I had never been used urr I mean if I have a problem and I want to get information then I am going and ask my friends over email … if I would have, usually when I have certain problem I phone people or send an email or just them but I am never using online to this"

Example 3:

"INTERVIEWER: do you ever use like messengers or like MSN

INTERVIEWEE: no

INTERVIEWER: is there any reason why

INTERVIEWEE: I just thought of it, I use the Internet for"

Additionally some participants stopped using instant messengers in favour of an OSN. Two of the participants interviewed described:

Example 4:

"INTERVIEWEE_PA: that's it MSN messenger and once she discovered the Facebook she cancelled herself from the others she said they are rubbish Facebook is great

INTERVIEWEE: yes"

Example 5:

"INTERVIEWEE: Skype hmm I am kind of not using it because hmm because I thought it was c***"

Whilst others participants reported reduced excitement as a reason for non-use. Two of the participants interviewed described:

Example 6:

"INTERVIEWEE: I don't know I just thought err know the glory of using it is not so ok hmm at the beginning I was all excited but now it is a bit boring"

Example 7:

"INTERVIEWEE: yeah it was like a little phase but now yeah if I wanted to get in touch with them I could always go back to Facebook"

Another participant wanted to use video conferencing for example Skype but was unable to do so because her friends did not use it. The participant interviewed described:

Example 8:

"INTERVIEWER: when you use MSN do you ever use your webcam?

INTERVIEWEE: yes

INTERVIEWER: how often do you do that?

INTERVIEWEE: hardly ever

INTERVIEWER: why do you not use that very often?

INTERVIEWEE: no one has it"

Finally some of participants reported not using instant messengers or OSNs because they felt they were difficult to use or unsafe. Three of the participants interviewed described:

Example 9:

"INTERVIEWER: do you use yahoo messenger as often as you use MSN?

INTERVIEWEE: no … yahoo is more difficult… I can't change the print if the other person is not on yahoo I can't change it"

Example 10:

"INTERVIEWEE: No I don't like MySpace at all I think that there is all viruses and teens and girls and dirty old men that are saying that they are teenage girls at least you have on Facebook hmm you can do the same on MySpace but the difference with like hmm when I was younger I used to use a lot of like chat rooms before I had Facebook you had to be friends with somebody you can communicate it not just because it once was on Facebook you used to see a little picture and the network they belonged to were they can see an image profile and you can set it and only get a picture but you could still see the whole picture and you can still see what networks they are on hmm I like the idea that Facebook seems so secure"

Example 11:

"INTERVIEWEE: I also want to get away from MSN as well because there is a load of viruses on there as well and people keep sending you instant messages so it get a bit boring"

3.4.3.4 Issues

Describes the problems faced by adults with cp while using online communication. The participants discussed a variety of issues such as: poor interface features, lack of interface personalisation, misuse of the term friend and text entry. Most of the issues reported were related to OSNs specifically Facebook. Five of the participants interviewed described:

Example 1:

"INTERVIEWER ok when you our using Facebook one of the things that you said is that it's the size of the text so that a real problem so if how are you able to use it now if it is so small INTERVIEWEE: I post it on word … and my software reads it to me"

Example 2:

"INTERVIEWEE: one of the big sort of problems I have is were they put all these buttons close together and sometimes the bigger the button the bigger the target area I have to click"

Example 3:

"INTERVIEWEE: Oh yeah sometimes the computer would play up you would do your password and it would still not let you in so you would have to do it like 3 or 4 times before it decided ok I will let you in"

Example 4:

"INTERVIEWEE: hmm I think that is like hmm misleading as well hmm that is one thing I would like to do is get Facebook to change the title of you know so and so are now friends you could say that so and so and so have made a connection … because I have people on Facebook that I wouldn't say were my friend"

Example 5:

"INTERVIEWEE: sometimes they only give you a certain amount of characters to put your message if you have a lot to say about yourself 250 characters you not going to … tell anything interesting you if your limited to what you can put down"

Additionally participants reported long and complicated tasks (for example sending messages) often slowed down or prevented their communication. Four of the participants interviewed described:

Example 6:

"INTERVIEWEE: yes it less less tasks"

Example 7:

"INTERVIEWEE: very complicated so you will get confused and in the end you would close it down"

Example 8:

"INTERVIEWEE: the design … it is a bit complicated"

Example 9:

"INTERVIEWEE_PA: writing down slow tiring

INTERVIEWEE: yes"

Other participants reported the language used by other OSN users as difficult to follow. Two of the participants interviewed described:

Example 10:

"INTERVIEWEE: hmm the only thing I have is hmm when the person who I am talking to uses big words that is not in my you know I mentioned awhile back that told him to ask me same question again"

Example 11:

"INTERVIEWEE: well the other people would need to have better access to interpret themselves so that if there first language wasn't English there got to be better interpreting services"

Whilst other participants reported not being able to control application requests and notifications as issues. One participant interviewed described:

Example 12:

"INTERVIEWEE: hmm that annoys me as well Facebook hmm people keep sending you hmm I wish you could tick an option that said I don't want any application requests you know I don't mind friend request but I don't like application request hmm"

During the study OSN Facebook underwent seven user interface changes (Hendrickson, 2009). As a result most of the participants reported abrupt and frequent user interface changes as an issue that reduced or prevented them from using OSN. Seven of the participants interviewed described:

Example 13:

"INTERVIEWEE: ok like when they first changed Facebook I really didn't like it when they first changed it from the old one to the new one I really didn't like it because it threw me"

Example 14:

"INTERVIEWEE: I feel that designers force technology onto people because they can and not because it is perhaps the best thing for them it because they can you know and they changed Facebook just because they can you know they didn't ask people if you want it changed they just changed it"

Example 15:

"INTERVIEWEE: urr yes urr Facebook to be honest I don't have time because its hmm I don't have usually it they are friends they are using Facebook more often but I don't basically I don't but also sometimes the interface is changing all the time and urr because I not using urr regularly I don't know for these changes I need to adopt these changes all the time also I need

to type password and all they procedures to I just urr I just rather send them an email it is easier"

Example 16:

"INTERVIEWEE_PA: I think when Facebook they change their layout it was 8 months ago … yeah she got crazy because she is getting used to were the things and with the switch she knows how many times she is going to click and press there and there and they are changing she has to learn new things so you find it quite irritating didn't you?

INTERVIEWEE: yes

INTERVIEWEE_PA: it makes time slow because they keep changing

INTERVIEWEE: yes

INTERVIEWEE_PA: when they change it they don't make it faster they are just changing the layout and sometimes in the page like the writing you find hard don't you

INTERVIEWEE: yes"

Example 17:

"INTERVIEWEE: if you gave never been on Facebook a computer oh this is Facebook and they have shown you for the day and when you go on Facebook you mind is so bogged that you don't even know what you are doing so in the end you close down so you get what I mean … you have to press this to get this because you have been on it and once you get the hang of it, it shouldn't be no problem cause every minute they are changing different you know"

Example 18:

"INTERVIEWEE: hmm I just don't like what they did I don't like the interface that they used and I don't like how they forced it onto people you must change to this you can do this because we can do this … ok hmm I can't remember what it was oh yeah when you used to have to have the wall the old interface was clearly defined you used to have the barriers this was you wall this was your profile but now it the wall has gone to tabs instead of areas instead of like clearly demarcated regions it has gone to tabs now"

Example 19:

"INTERVIEWEE: I sometimes the interface is changing all the time and urr because I not using urr regularly I don't know for these changes these changes I need to adopt these changes

all the time also I need to type password and all they procedures to I just urr I just would rather send them an email it is easier for me"

However change is not restricted to OSNs, participants also reported it was an issue within email inboxes for example Windows Live Mail. One participant interviewed described:

Example 20:

"INTERVIEWEE: another think I forgot to tell you when you go on hotmail the thing what is annoying they constant change it".

3.4.3.5 Future use

Describes how adults with cp would like to use online communication in the future. This included tasks and potential improvements. Participants reported that they wanted to try to use online communication less in favour of face-to-face communication. Five of the participants interviewed described:

Example 1:

"INTERVIEWEE: I would use it less often … I would try and meet them and talking to them"

Example 2:

INTERVIEWEE: I would do face-to-face more face-to-face that using Internet"

Example 3:

"INTERVIEWER: would you prefer that kind of communication rather than writing text

INTERVIEWEE: yes

INTERVIEWER" so you like face to face …?

INTERVIEWEE: yes I would"

Example 4:

"INTERVIEWEE: actually I would probably say face to face rather than online because whether it is a friend you have meet online or you just know you can know them you can see

other than the picture online sort of thing and the conversation you don't know them really well"

Example 5:

"INTERVIEWER: one of the reasons you are not using it that much is because it is addictive and you want to meet people more face to face if Facebook had for example allowed you to use your webcam would you use it more?

INTERVIEWEE: yes"

Participants then began to discuss future online communication improvements focusing on OSNs. These improvements were linked to increased control, speed and help. Eight of the participants interviewed described:

Example 6:

"INTERVIEWER: so like a better form of help so that you don't have to keep reading?

INTERVIEWEE: yes"

Example 7:

'INTERVIEWEE_PA: she thinks Facebook is not fast when she is sending messages to people yeah"

Example 8:

"INTERVIEWER: how fast would you like it? Like instant?

INTERVIEWEE: yes

INTERVIEWEE_PA: yes she would like to know that they receive it so she wait for it wait for it and no answer then she find out that these people really didn't get the message"

"INTERVIEWER: like a confirmation you would like you think that would be useful?

INTERVIEWEE: yes"

Example 9:

"INTERVIEWEE: I would say for Facebook I'd be hmm page or column would be shown for different types of disability and different instructions on either how to get into Facebook or go on dating sites and it should be the same"

Example 10:

"INTERVIEWER: it would be a lot easier if you could change the colour of Facebook?

INTERVIEWEE: yes yes"

Example 11:

"INTERVIEWEE: just change the colouring because after a while it gets boring you see the same things I am not being funny they have got to change

INTERVIEWER: you would like to have more control of what you are seeing?

INTERVIEWEE: yeah"

As with computer use participants suggested one of the ways online communication could be made faster is to use voice recognition for their text entry. Two of the participants interviewed described:

Example 12:

"INTERVIEWEE: … it takes me ages keying in things voice recognition would make things a lot easier"

Example 13:

"INTERVIEWEE: They need to update that they need to say well you got this problem because not everybody is a good reader so they got to put voice recognition on that so that people understand what they are doing"

Participants then discussed their online communication privacy. They suggested new AT devices and increase person research prior to accepting friend requests could increase their privacy. Two of the participants interviewed described:

Example 14:

"INTERVIEWEE_PA: that's why you want a new calibrator and new communicator as it will give her more privacy

INTERVIEWEE: yes"

Example 15:

"INTERVIEWER: if you could add something do you know what you would like to add, would it be another communication thing?

INTERVIEWEE_PA: I think you would go for privacy won't you?

INTERVIEWEE: yes

INTERVIEWEE_PA: yeah and the she added what people can see for example she adds from the Facebook they can't see her hmm some of the wall and they cant see her friend list because she has people in there so you basically controlling do you?

INTERVIEWEE: yes"

Further to this participants discussed creating an additional profile so that they could verify their privacy settings. Two of the participants interviewed described:

Example 16:

"INTERVIEWEE_PA: yeah and then then you created another Facebook and then she added herself"

Example 17:

INTERVIEWER: so you have two?

INTERVIEWEE: yes

INTERVIEWEE_PA: oh yes so that she can she what people can see … friends, walls or pictures of an album she has like 50 albums and she count like everybody in them and they can see these albums if she wants them to so they can be close to her.

INTERVIEWEE: yes"

3.4.3.6 Positive aspects

Describes what adults with cp consider to be the positive aspects of online communication. Participants reported ease of use, finding lost friends, lost friends finding the participants, place for storing friends, communicating with friends, finding out what friends are doing and organising face-to-face meetings as positive aspects of online communication use. Nine of the participants interviewed described:

Example 1:

"INTERVIEWER: why do you use MSN messenger?

INTERVIEWEE: because it is easier than text"

Example 2:

"INTERVIEWEE: when you move on you address gets lost things like that, but once you are on Facebook people get to oh gosh I haven't seen her in ages let me contact her, you get what I mean so it is a really interactive website for people who are looking for people you know it is really good because then you know what is really going on in their lives and they know what is going on in yours."

Example 3:

"INTERVIEWEE: it is possible to meet someone from the distant past especially if you don't have their telephone number if you could recognise there photo it is so easy to find someone you haven't spoken to for a long time"

Example 4:

"INTERVIEWEE: well certain you never ok you are on Facebook but certain people who you met years ago would actually come online who you haven't spoken to for 15 years you know so you got to know new friends who you haven't spoken to or seen … because then your weren't so isolated"

Example 5:

"INTERVIEWEE: because most of the people work you know terrible hours if I try to ring and email them they don't respond so I know they will automatically respond on their PC or their computer cause that is what they live for so I know they would respond"

Example 6:

"INTERVIEWER: what would you say are the benefits of Facebook?

INTERVIEWEE: the socialising"

Example 7:

"INTERVIEWEE: Facebook I would say that it is there's more hmm its open to you and on a normal emailing hmm such as sort of news and you can read up on where's your friends and how to find your friends and hmm where"

Example 8:

"INTERVIEWEE_PA: she could make an organise say let meet up and through the Facebook she can meet up with people and out clubbing and doing things so I don't know you find it more safe did you

INTERVIEWEE: yes"

Participants then began to discuss controlling friend lists as a positive aspect. Two participants interviewed described:

Example 9:

"INTERVIEWEE_PA: I think you find that people are more genuine instead of random people adding you had more control on the Facebook and who people can see her page and that way you find it Facebook more useful on the messenger or Bebo

INTERVIEWEE: yes"

Example 10:

"INTERVIEWER: so you like have got more control it makes it more stronger and safer community I think that is what you mean

INTERVIEWEE: yes"

Furthermore participants reported feeling safer when using specific OSN Facebook. Two of the participants interviewed described:

Example 11:

"INTERVIEWEE_PA: … I feel that she is safer on Facebook than other social work you never know who is genuine and is pedophile that why when people add her so do research about them

INTERVIEWEE: yes"

Example 12:

"INTERVIEWEE_PA: I think you find that people are more genuine instead of random people adding you had more control on the Facebook and who people can see her page and that way you find it Facebook more useful on the messenger or Bebo she couldn't make an organise say

lets meet up and through Facebook she can meet up with people and out clubbing and doing things so I don't know you find it more safe didn't you?

INTERVIEWEE: yes

INTERVIEWER: OK what did you do the last time you used Facebook?

INTERVIEWEE: hmm I looked at who had sent me messages and I deleted people I didn't want"

Participants finished by discussing the independence that online communication provide. One participant reported feeling depressed and isolated when not using online communication and having increased confidence when using them. Five of the participants interviewed described:

Example 13:

"INTERVIEWEE: it is the way I am my disability some people are awkward if like people like me or the same they will see and they will not talk to you and have a negative attitude so I chat online … I don't like people hmm the reason why I am saying it helps"

Example 14:

"INTERVIEWEE_PA: I think she didn't have communication with different people and was a very depressed girl

INTERVIEWEE: yes

INTERVIEWEE_PA: you use to come home very sad and people don't communicate with you and ignoring you wasn't it?

INTERVIEWEE: yes

INTERVIEWEE_PA find it quite difficult and when the Facebook came out it gave her more control of what to do when she wanted to use the computer I had to sit with her and I had to click every single page she asked me to that why when she wanted to search something she did want anyone to know she could because she didn't have that independence didn't you and if I remember you went to Duncan James page like 5 times or 10 times a day and I got bored to say you know it's the same things all the time and she say I want to you know it didn't give more independence for what she wanted to do and when we found out that Facebook came out she doesn't need anybody she can do everything herself isn't it.

INTERVIEWEE: yes

INTERVIEWEE: I remember like you find it new life

INTERVIEWEE: yes"

Example 15:

"INTERVIEWEE: hmm I think from a wider disability perspective they enable people that are isolated to have a life …".

Example 16:

"INTERVIEWER: In terms of what you were saying earlier on that you need communication that enable you to sit as you are unable to walk around that much and so you don't fall in roads would you say that Facebook helps with that in terms of being able to communication with like your friends and family

INTERVIEWEE: yeah because you can see how you are emailing and you can see what is going on and they would show you pictures of what they have being doing is yeah it is ok

INTERVIEWER: ok so is it better than trying to walk around and do the same things

INTERVIEWEE: yeah yeah".

Example 17:

"INTERVIEWEE_PA: yeah it would give her more independence is it?

INTERVIEWEE: yes".

3.4.3.7 Negative aspects

Describes what adults with cp consider to be the negative aspects of online communication. Participants discussed worrying about the people they were talking to, felt it was too time consuming, the privacy of their messages, status updates and personal information and felt pressured to talk to people as negative aspects. Eleven of the participants interviewed described:

Example 19:

"INTERVIEWEE: ok I got in to trouble this year because some person wanted to come to London from Russia to meet me but she was quick and I suspected it was a scam"

Example 20:

"INTERVIEWER: do you ever worry when your on Facebook or on a dating site or whatever community is about the people you are talking to

INTERVIEWEE: yes"

Example 21:

"INTERVIEWEE: hmm also all this kind of additional kind of things hug me and this urr post how I feel today I just don't have time for this kind of things its just urr time consuming…"

Example 22:

"INTERVIEWEE: hmm my mum and dad aren't on Facebook but I have my family so I have to watch out what I put on there and I learnt that the hard way because I put on there one of my statuses that I was sad and my nan and my auntie went and told my mum that I had put that on there and she was like why you sad…"

Example 23:

"INTERVIEWEE: yes I think that's what Facebook is all about making connections it even goes into my relationship status on Facebook so my director of studies can know to much about me my personal and how I you whether I have a girlfriend or not"

Example 24:

"INTERVIEWER: I mean one thing mentioned earlier was privacy hmm you don't like people knowing what you are doing all the time and you don't like people reading you messages all the time so I suppose that could be a negative way?

INTERVIEWEE: yes"

Example 25:

"INTERVIEWEE: even tho you don't talk to them you still see every single word every face there you can see the sickos you can see the people who are in bad groups or the crazy people"

Example 26:

"INTERVIEWEE: my supervisor is part of my friend list but I rather she wasn't … because it is an invasion of my space … Facebook is my personal space"

Example 27:

"INTERVIEWEE: sometimes I get bored because I am seeing the same people"

Example 28:

"INTERVIEWEE: well with the Internet dating being pressurised things things just happen so fast"

3.4.3.8 Discussion

The results from the study indicated that OSN use among adults with cp in this sample is 13. Thirteen of the 14 participants said they had access to and used OSNs favouring Facebook, but they also used MySpace and Bebo. OSN use was carried out at home because it was felt more private. However OSN use was also carried out at their place of work or education and at centres directed at people with disabilities. The amount of time spent using OSNs varied. Some participants reported carrying out use for up to 6 hours a day, whilst others reported use throughout the day. However the findings indicated that the people the participants communicated with often affected when use was carried out. This aspect of the study produced results that partially corroborate the findings of previous work in this field.

A survey by Manna (2005) and Belchiorb et al (2005) identified 71% (aged under 60 years) and 79% (aged over 60 years) used their computers to carry out social contact. The results from the study indicate that participants used OSNs to talk to family members and old school friends. These findings were further echoed by Seymour and Lupton (2004) that suggested individuals with motor and visual impairments view unspecified online communication as an important way to engage with others, and to maintain and develop significant friendships. Such individuals also favored disability related sites to interact with others with similar disability experiences.

The study indicated that participants felt OSNs were important and allowed them to communicate freely and independently. OSNs were used to send public and private messages to find out what family and friends were doing, organise face-to-face meetings, and check friend requests. Participants also reported leaving comments on photographs and using applications to elicit communication from their family and friends. However the participants rarely updated their own statuses or uploaded personal photographs. This was because they wanted to keep what they were doing private or they felt their friends would not be interested.

Surprisingly the study indicated that people with cp have an above average friend list, more than 130 friends (Facebook Press Room, 2010), but often chose to communicate with few of them because they felt a reduced trust amongst their friends. This aspect of the study produced results that partially corroborate the findings of previous work in this field. Consumer Expert Group (2009) indicated that the Internet can allow more independence because they can stay in touch with friends and family members more easily. Previous work has indicated that people with cp are OSN 'followers' and 'faithfuls' (Office of Communications, 2008).

Another finding was that OSN non-use among adults with cp in this sample is low (only 1 of the 13, 7.6%) due to non-ownership and the inability (lack of confidence) to ask for help at their local community centre. However the study indicated that some participants were partial non-users. They only carried out OSN use to aid offline communication. This study produced results that did not corroborate the findings of previous work in this field. AbilityNet (2008) identified that CAPTCHA images prevented users with disabilities from registering for and using OSNs. This was also reported by Consumer Expert Group, 2009). This study indicated that cost, devices and broadband subscription, was a reason for non-use. However previous research has indicated that some people with cp are OSN 'functionals' (Office of Communications, 2008).

Another important finding was that a variety of issues are faced when adults with cp in this sample use OSN. These included poor user interface features, long and complicated tasks, and lack of user interface personalisation for example text sizing. This aspect the of study produced results that partially corroborate the findings of previous work in this field. AbilityNet (2008) identified a lack of links that allow users to jump over main navigation links and underlined links that are hard to see were issues. However the study supported the idea that hard coded text size meant text was difficult or impossible to read, and keyboard only users found carrying out OSN task lengthy.

Another finding was that adults with cp in this sample would like to try to use OSNs less in favour of face-to-face communication. The study findings indicate that improving communication control, speed and OSN help would encourage them to use OSNs more. This aspect of the study produced results that

partially corroborate the findings of previous work in this field. AbilityNet (2008) identified that help that detailed common questions and answers regarding the websites were often provided but there was no help for users who had difficultly using the website due to their disability or AT devices. This lack of help reduced their use of OSNs.

Another finding was that adults with cp in this sample feel the positive aspects of OSN use were finding lost friends, lost friends finding them, place for storing friends contact information, communicating with friends, perceiving their communication as safe. The study findings indicated that OSNs were time consuming and adults with cp are unsure about the privacy of their messages. The findings indicated that people with cp worried about their safety when talking to new friends. This study produced results that did not corroborate the findings of previous work in this field. Surprisingly the study findings indicated that connection control as a facilitating factor that affects OSN use.

The study also identified two inhibiting factors user interface changes and the term friend used by OSN affected their perceived privacy. This aspect of the study produced results that partially corroborate the findings of previous work in this field. Manna (2005) and Belchiorb et al (2005) identified that 8.3% (aged under 60) and 7.1% (aged over 60) felt privacy and trust inhibit their use. The study did not specify if the privacy and trust referenced computer use, Internet use or social contact. Recently Hollier (2012) reiterated this finding (Lewis, 2010) by identifying that changing OSN are key barriers to OSN use for people with disabilities (see chapter 2 section 2.6.7).

The final finding was that people with cp in this sample also use other types of online communication, favouring email but also instant messengers, video-conferencing and dating websites. Participants did not report using online bulletin boards or support groups. The findings indicated that family members or friends introduced them to online communication. The findings indicate that some participants did not use online communication voluntarily. They felt forced to use online communication, for example instant messengers, because family and friends were using them. This aspect of the study produced results that partially corroborate the findings of previous work in this field.

Kaye (2000) survey of computer and Internet use among people with disabilities indicated that 67.1% of 2,076 people with work disabilities surveyed used email. Whilst Dobransky and Hargittai (2006) study indicated that 83.5% of people with disabilities use email and instant messaging and 4.4% use video conferencing. However Pilling (2004) survey of 193 people with disabilities identified that 90% used email but seldom used chat rooms, instant messaging and newsgroups.

3.4.4 Offline communication use

Describes how adults with cp communicate with family members and friends using offline (conventional) communication. All the participants reported using offline communication; some participants reported using telephones and text message. Four of the participants interviewed described:

> **Example 1:**
>
> "INTERVIEWEE: sometimes phone"
>
> **Example 2:**
>
> "INTERVIEWER: sometimes you use a telephone?
>
> INTERVIEWEE: or text
>
> INTERVIEWER: do you have a mobile phone to do that?
>
> INTERVIEWEE: yeah … weekends I don't use it at all … I use it about 5 times a day texting"
>
> **Example 3:**
>
> "INTERVIEWEE: I have got a mobile so I call them up and they call me up"
>
> **Example 4:**
>
> "INTERVIEWEE: texting I use most calls but it depends on the person they know me I can call them up because they know how I talk so they are more patient with me if not I text them"

However some of the participants reported problems using telephones because of speech or upper-limb impairments. Whilst others were unable to send text messages due to their upper-limb impairments and required support individuals to write messages on their behalf. Participants reported that this support often affected their communication privacy and independence. Four of the participants interviewed described:

> **Example 5:**
>
> "INTERVIEWEE: oh no it is very difficult for me because I am on sticks and when someone rings my disability goes up the wall and I fall in the road so I don't bother … I can't drop my sticks and answer the phone … unless I can sit down … but if I am walking and someone rings I cant answer it, I cant answer the phone because there are no seats"

Example 6:

"INTERVIEWEE_PA: when her phone rings her personal assistant answers and if she wants to send a text she has to type and I have to see it which doesn't give you much privacy isn't it?

INTERVIEWEE: yes

INTERVIEWEE: that's why you said my first priority is I want to do it myself isn't it

INTERVIEWEE: yes"

Example 7:

"INTERVIEWEE: asking who every carer working to text them"

Example 8:

"INTERVIEWEE_PA: she used to get the carer to send text messages like hugs and I love you but she would shorten it down because she would get bored when she would have to put the whole sentence together

INTERVIEWEE: yes"

Furthermore most of the participants reported they were unable to use telephone communication due to natural speech impairments. Participants preferred face-to-face or text message communication. Four of the participants interviewed described:

Example 9:

"INTERVIEWEE: face-to-face no it depends I do like using the phone because of my speech I have such a preference between phone and the internet it would have to be the internet 100% of the time … it is ok if you don't see me you know about cp so you are clued in 100% but someone not knowing anything about cp they hear me they don't see me"

Example 10:

"INTERVIEWEE: voice … hmm if they can't understand me I prefer email them"

Example 11:

"INTERVIEWER: do you use phones at any times?

INTERVIEWEE: no I cant … I really don't like phones … people don't understand me"

Example 12:

"INTERVIEWEE: I would go and text message and I would phone … I prefer texting than calling … because it is cheaper and it is more easier"

The participants also reported using letters and postcards to communicate but used them infrequently. One participant reported requiring a support individual to write handwritten letters on the participants behalf. Whilst another participant reported only writing letters on the computer because it was easier. Four of the participants interviewed described:

Example 13:

"INTERVIEWEE: write letters very occasionally"

Example 14:

"INTERVIEWEE: yeah write letters

INTERVIEWER: do you do that often?

INTERVIEWEE: no not really

INTERVIEWER: do you hand write them?

INTERVIEWEE: Oh no I use Word … it is easier … because I can type it and save it and I can print it and I can always say I have written it and always go back"

Example 15:

"INTERVIEWEE: I'm writing postcards, emails using mobile phones, line line phone… face to face communicate … I like to write letters…as a child I was writing letters quite a lot"

Example 16:

"INTERVIEWEE: I send yes hmm my mum writes letters on the computer and sends them of for me"

Additionally other participants reported favouring face-to-face communication. They met their friends regularly in bars, pubs, restaurants, shopping malls and centres and clubs directed at people with disabilities. Two of the participants interviewed described:

Example 17:

"INTERVIEWER: do you every meet people face-to-face?

INTERVIEWEE: yes I do that all that all the time if I can … anywhere restaurant or bars it depends on my friends or my friends house or bars what they want … often meet my friends everyday and we go out once a week we go out we do it quite often to catch up … I would go to the pub and have a few pints once or twice a month I will a chess matches with the chess club"

Example 18:

"INTERVIEWEE: I will meet people"

Furthermore participants reported requiring help from a support individual to organise face-to-face communication. One of the participants interviewed described:

Example 19:

"INTERVIEWEE_PA: mum had to organise it and the personal assistant as well to go with her and she would choose which venue they were going to meet and the other personal assistant it depending which one was working and which had a day of the week

INTERVIEWEE: yes"

However most of the participants reported favouring face-to-face communication but were unable to use this type of communication as often as they would like. One of the participants interviewed reported:

Example 20:

"INTERVIEWEE: I'd rather using old fashioned way of communication"

Finally participants reported face-to-face communication was impossible, meaning that they often felt isolated and unhappy. One of the participants interviewed described:

Example 21:

"INTERVIEWEE_PA: you used to come home very sad and people don't communicate with you and ignoring you wasn't it?

INTERVIEWEE: yes".

3.4.4.1 Discussion

The results from the study indicated that offline communication use among adults with cp in this sample is 100%. The participants favoured face-to-face communication, regularly meeting friends in bars, pubs, restaurants, shopping malls and centres and clubs directed at people with disabilities. However the study indicated that they were unable to use face-to-face communication as often as they would like. Additionally the participants found face-to-face communication difficult or impossible. This aspect of the study produced results that partially corroborate the findings of previous work in this field. Pilling (2004) survey of 193 people with disabilities reported only 60% of people used conventional methods for example phone, and letters for keeping in touch with people. Ballin and Balandin (2007) stated face-to-face communication is often difficult among people with disabilities due to insufficient time to communicate.

Another finding was that adults with cp in this sample often used telephone and text message communication. However the study indicated that telephone communication was difficult due to speech or upper-limb impairments. This aspect of the study produced results that corroborate the findings of previous work in this field. Ballin and Balandin (2007) stated people with disabilities often have difficulties using telephone communication as it can be timely and hard to understand.

The final finding was that offline communication among adults with cp in this sample often required support individuals to send text messages, answer telephone calls, and write letters. The study indicated that the support required often negatively affects communication privacy and independence. This aspect of the study produced results that do not corroborate the findings of previous work in this field.

3.5 Chapter Discussion

Initially this PhD research explored the experiences and challenges faced when adults with cp use online communication, specifically OSNs (see chapter 3). The study successfully answered research question one and two (see chapter 1 section 1.4). The study also provided an overall understanding of the technology, computers and the Internet, used to enable OSN participation.

Fourteen interviews were carried out with participants with different types of cp. Participants were predominately female (n= 10), all aged over 18 years and had diverse backgrounds. The following questions were addressed:

- Where and when do they use the technology?
- What is their purpose for using the technology?
- Do they require AT devices and or support to use the technology?
- Do they experience any problems when using the technology?
- What are the advantages and disadvantages of using the technology?
- What are their reasons for not using the technology?

The interviews were audio and video recorded, the raw data was transcribed verbatim and user profiles were developed to support data familiarisation. The data was then coded using the GIA and a model based on the most important codes answering the study questions was developed and used to report the findings. The study coding divided the study into four parts:

3.5.1 Computer use

The study identified that computer use among participants in the study with cp was 13 out of 14. Adults with cp often carried out use at home or at their place of work or education. They use computers most days for long periods of time (up to 8 hours). Computer use was mostly restricted to online tasks but participants also wrote letters, played games and used Microsoft Office for personal and educational activities. More rarely they also watched DVDs and played music. One participant did not use a computer due to non-ownership and the inability (lack of confidence) to ask for help at their local community centre.

The study also found varying computer issues that slowed down or prevented use, these included instability and malfunctioning operating systems, poor user interface features and poor computer battery life. This often meant participants required support to use their computers such as ISGs, half-QWERTY keyboards alongside sticky key functions, screen reading software and external keyboards. However the AT devices used did not always assist use meaning some users required help from a support individual.

3.5.2 Internet use

The study found that Internet use among participants in the study with cp was 13 out of 14, i.e. everyone that using a computer used the Internet. Adults with cp often carried out use at home and at their place of work or education but also at friends' properties. They use the Internet to find health information, education, celebrities, hobbies, jobs, shops, entertainment for example plays and shows, banking and searching for videos. They also watched TV, listened to the radio and read books.

Furthermore, the study found that a variety of issues were faced when participants used the Internet, these included speed of the Internet, user interface features (for example small text size) and unstable and changing websites. The study also indicated that participants had problems entering into websites especially e-commerce websites and websites requiring passwords.

3.5.3 Online communication

The study found that 13 out of 14 of participants had access to and used OSNs favouring Facebook but they also participated in MySpace and Bebo i.e. everyone that using a Internet used online communication. OSN use was carried out at home because it was felt more private. However use was also carried out at their place of work or education and at centres directed at people with disabilities. The amount of time spent using OSNs varied. Some of the participants carried out use for up to 6 hours per day, whilst others reported use throughout the day. However the study indicated that the people they communicated with often affected when use was carried out.

The study also found that OSNs were seen as important because they allow adults with cp to communicate freely and independently. The study found that participants were using OSNs to send public and private messages to find out what family and friends were doing, organise face-to-face meetings, and check friend requests. They were also leaving comments on photographs and using applications to elicit communication from their family and friends. However they rarely updated their own statuses or uploaded personal photographs. This was because they wanted to keep what they were doing private or they felt their friends would not be interested.

The study also found that participants had an above average friend list but often chose to communicate with few of them because they felt a reduced trust amongst their friends. The study also found a variety of issues that adults with cp faced when using OSNs, these included poor user interface features, long and complicated tasks, and lack of user interface personalisation for example text sizing.

The study found that participants believed the positive aspects of OSNs use were finding lost friends, lost friends finding them, a place for storing friends contact information, communicating with friends and perceiving their communication as safe. The study found that the negative aspects of OSNs include: they are time consuming, unsure about the privacy of their messages. Conversely the study indicated that participants often worried about their safety when talking to new friends.

The study identified two key inhibiting factors; changing OSNs and the term friend used by OSNs affected their perceived privacy.
Finally, the study found that participants also used other types of online communication favouring email but also instant messengers, video-conferencing services and dating websites and participants family members and friends had introduced them. Additionally some adults with cp did not use online communication voluntarily because they felt forced because their family and friends were using them.

3.5.4 Offline communication

The study found that participants were partially using OSNs. They mainly carried out OSN use to aid offline communication. Furthermore the results from the study indicated that offline communication

use among participants was 100%. They favoured face-to-face communication, regularly meeting friends in bars, pubs, restaurants, shopping malls and centres and clubs directed at people with disabilities. However the study found that they were unable to use face-to-face communication as often as they would like because they found it difficult or impossible. This meant they often used telephone and text message communication. However the study found that telephone communication was difficult due to speech or upper-limb impairments. The study also found that offline communication among adults with cp often required support individuals to send text messages, answer telephone calls, and write letters. The study suggested that the support required often negatively affected their communication privacy and independence.

The results from the exploratory interview study produced results that did not fully corroborate the findings of previous HCI work especially when considering OSNs use and non-use, OSN specifics and OSN issues specifically time spent participating. However the study did partially corroborate some findings of previous HCI work specifically OSNs inaccessibility, preference over face-to-face communication. Specific problems arose from changing OSNs and difficulties of privacy.

3.5.5 Strengths

The study has made this under represented community visible. It has given adults with cp a voice concerning there use of OSNs. The semi-structured interview method used offered participants space to discuss what was important. Additionally the study solely focused on a broad spectrum of cp without encompassing other disabilities meaning the findings appropriately reflect the cp community.

Finally the varied questions asked within the study allowed for a in-depth understanding of the current situation of OSN use among the cp community. Not only has the study put forward why and how adults with cp use OSNs, it also establishes how OSNs fit into their lives both online and offline therefore filling the gap within previous HCI research.

3.5.6 Weaknesses

The study presented three key weaknesses:

1. The term ‘online communication’ was used to establish the role of OSNs without explicitly referring to it. This created a confusion when reporting the findings as OSNs were reported alongside other CMC technologies such as Instant Messenger and Video Chat. These findings were interesting but are not the key premise of the PhD research (see chapter 10 section 10.2 for future work that could overcome this limitation).
2. Participant recruitment took 10 months meaning a static understanding of the current situation can not be put forward, for example the fast changing nature of Internet technology likely impacted what was discussed (see chapter 10 section 10.2 for future work that could overcome this limitation).

3. As a result of the method some participants, especially those with natural speech impairments or that used AAC devices, could not fully describe their technology use without assistance from a support individual (see chapter 3 section 3.4.3.5 example 8 and 9). Due to the nature of these individuals impairments and the role support individuals play within their lives this would be very difficult to overcome if the study was repeated. Therefore it is recommended a follow-up observational study is carried out to verify such participants OSN use, for example OSNs visited, AT devices used and location of use and tasks carried out.

Chapter 4 – Study Two: In-context field observations

4.1 Introduction

The first study, an exploratory interview study (see chapter 3) identified the reasons for use and nonuse of OSNs by people with cp and also key themes including independence, privacy, trust, and change, together with challenges such as slow text entry, poor user interface features, lengthy and complicated tasks, lack of user interface personalization and unavailable or inappropriate within-website help. As a result of the method some participants, especially those with natural speech impairments or that used AAC devices (see chapter 3 section 3.4.3.5 example 8 and 9), could not fully describe their technology use without assistance from a support individual. This resulted in a follow-up in-context observational study that was carried out in 2010.

Observations were used because they allow the researcher to view what users actually do in context i.e. how individuals with cp interact with OSNs. Thus the observations allowed the researcher to focus attention on specific areas of interest such as OSNs visited, AT devices used, location of use and tasks carried out and users feelings during interaction. However it was noted that the observations could be obtrusive resulting in the participant altering their behavior due to the presence of the researcher (Preece et al 1994). To overcome this the researcher demonstrated good interpersonal skills and followed a structured protocol (see section 4.3.4).

The study received ethical clearance from City University London. This chapter discusses the study questions, method, subjects, organization of data and findings.

4.2 Study questions

The study questions addressed were:

1. How are adults with cp physically using OSNs within a specific natural context?
2. What are adults with cp goals when using OSNs?
3. What are the tasks attempted and completed when users with cp use OSNs?

4. What problems are faced when adults with cp use OSNs?
5. What feelings do adults with cp have while interacting with OSNs?
6. What role do support individuals play in supporting adults with cp to use OSNs?

4.3 Method

This section discusses the recruitment process, observational session design, protocol, apparatus and materials used and the participants.

4.3.1 Recruitment

The study used open recruitment; adults from all City University London programmes, departments and professions were recruited using posters. Due to the participant recruitment lessons learnt during the exploratory interview study (see chapter 3 section 3.3.1) City University London Disability Learning Success, RBKC, ADKC and Scope Charity were approached. Presentations were given to relevant people and the study was advertised on Scope.org.uk charity website and the ADKC newsletter. As a result recruitment for this study took three days.

4.3.2 Participants

During initial contact, potential participants were asked to complete a pre-study questionnaire (see appendix a section a2.3). The questionnaire asked participants about their personal particulars such as gender; age; their disability status (type of cp; any AT devices used and other additional disabilities or limitations); if they use OSNs; where they use OSNs, their availability to participate in the study and contact information. The questionnaire was completed either in person, by telephone call or email. The questionnaire took up to 25 minutes to complete. Exclusion would occurred if the participant did not use OSNs, was under the age of 18, did not have cp or had unassociated impairment. No potential participants were excluded from the study therefore sampling rate was 100% and it is believed that participants represented the cp population as multiple versions of the disability are observed (see table 11). The study involved the following seven participants:

ID	Participated Observation before?	Affiliated with City?	Age range	Cerebral palsy type	Other limitations	Aids or assistive technology	Personal assistant?
OS1	No	No	Male	Atheoid	No	Yes	Yes
OS2	No	No	Male	Spastic	No	Yes	No
OS3	No	No	Male	Spastic	No	Yes	No
OS4	No	No	Female	Spastic	No	Yes	No
OS5	No	No	Female	Spastic	No	Yes	Yes
OS6	Yes	No	Female	Ataxic	No	Yes	No
OS7	No	No	Male	Spastic	No	Yes	No

Table 10. Factual participant data taken from pre-observation questionnaire.

ID	Uses OSNs?	OSN used?
OS1	Yes	Facebook
OS2	Yes	Facebook
OS3	Yes	Facebook
OS4	Yes	Facebook
OS5	Yes	Facebook
OS6	Yes	Facebook
OS7	Yes	Facebook

Table 11. Factual participant use data, pertaining to OSN use.

4.3.3 Process

The observations took place over a three week period, between 9am to 5pm. Each participant was observed three times over three consecutive weeks. Sessions lasted up to 30 minutes: participants were observed while using OSNs for up to 20-minutes The observations sessions were unstructured to ensure participants would use OSNs naturally i.e. day-to-day use. The study was predominately concerned with the tasks the participants carried out and the issues they faced. This followed on from the interview study (see chapter 3), however this study focused on the solely participants without support individuals opinions or influence. Each observation session was followed by a 10 minute interview. The interview asked the participants:

1. What goals did you attempt to complete during the observation session?
2. How did you feel while you attempted to complete said goals?
3. Did you come across any problems?

1. If yes, how did you feel when problems occurred?

Participants actions were video recorded so that the observations can be reviewed to ensure the understandings derived from the observations were clear. Though there are cons to videoing participants actions such as observer bias (observer records not what actually happened but what they either wanted to see, expected to see, or merely thought they saw (University of Strathclyde, 2012)) and observer effect (which refers to the way in which the presence of an observer in some way influences the behaviour of those being observed (University of Strathclyde, 2012)) it was felt that these did not outweigh the positives i.e. gathering a detailed descriptive narrative data. Furthermore it is believed that videoing all participants actions would reduce and or remove the impact of observer bias.

The total duration of the study for each participant was up to 115 minutes.

4.3.4 Protocol

The following protocol developed by Sharpe et al (2007) was used:

1. Provide participant with background information about the observational study,
2. Ask the participant to read adult participant consent form and confirm permission to draw, photograph and video and audio record the observation session,
3. Inform the participant that the observation session can be stopped whenever they like and if they want to take a break, feel upset or unwell the observation session will end,
4. If a support individual is present give support individual background information about the observation study and provide another copy of the explanatory sheet and ask support individual to give consent,
5. Give participant the opportunity to ask questions,
6. Check audio and video recorder. Position the video equipment so that the participant, the workstation and the surroundings can be recorded. Also position the audio equipment so that the participant can be heard,

7. Start audio and video recordings,
8. Photograph participant surroundings: room, workstation and any assistive technologies and or communication aids used,
9. Draw a layout of the space using drawing utensils,
10. Ask participant to begin using their chosen OSN,
11. Inform the participant that when they have finished using their chosen OSN to inform the researcher,
12. Observe participant as they interact with the OSN: website used, the task attempted and completed, the assistive technology and or individual support required; length-of-time taken to complete tasks and the order of actions to complete a task, and any problems faced and the participant subsequent action (i.e. task solution or task abandonment),
13. During the observation also write notes regarding the above actions and take photographs,
14. When the participant indicates that they have finished using their chosen OSN conduct a post-observation interview,
15. Stop video and audio recordings,

- End of observation session -

16. Ask participant if they are still happy to continue to take part in the observational study. Reconfirm the date and time for the next observation session,
17. Inform the participant that they can contact the researcher at any time to discuss what has been shared during the observation session or if the participant has any questions about the research study,
18. Thank the participant for participating.

4.3.5 Apparatus and materials

The following apparatus and materials were required to carry out each observation:

APPARATUS was set up similarly at each observation location:

- Video camcorder,
- Video camcorder tapes (one for each observation),
- Tripod,

- Digital camera,
- SDHC digital camera storage card,
- Dictation machine,
- Writing and drawing utensils,
- Note and drawing paper.

MATERIALS

- Participant covering letter (see appendix a section a.2.2),
- Explanatory statement for study participants (see appendix a section a.2.4),
- Explanatory statement for participants support individual (see appendix a section a.2.4),
- Adult informed consent form (see appendix a section a.2.5),
- Adult informed consent form for participants support individual (see appendix a section a.2.6)
- Pre-observation questionnaire (see appendix a section a.2.3),
- Observation session notes sheets (see appendix a section a.2.7).

4.3.6 Data organisation

4.3.6.1 Data cleaning

This section discusses how data was gathered and organised.

4.3.6.1.1 Video

The observation videos were exported to video analysis software (Vcode v.1.2.1 (see figure 34)) and reviewed repeatedly to aid familiarisation. Key tasks and issue sequences alongside interaction styles were event marked (sequences that represented participants OSN use during the observation session (see table 13 for marker list)).

Though participants verbal utterances and non-verbal behaviour were recorded, table 13 focuses on the participants actions and issues whilst interacting with OSNs. This is considered in line with the study questions.

The sequences were divided into key screenshots that conveyed the AT devices, task and or issue. The screenshots were then put together in Microsoft PowerPoint creating a video still depicting the sequence of events, alongside an event log (see figure 35). This helped to report the study findings (see section 4.4.4 for example and see appendix b section b.2. for sample data).

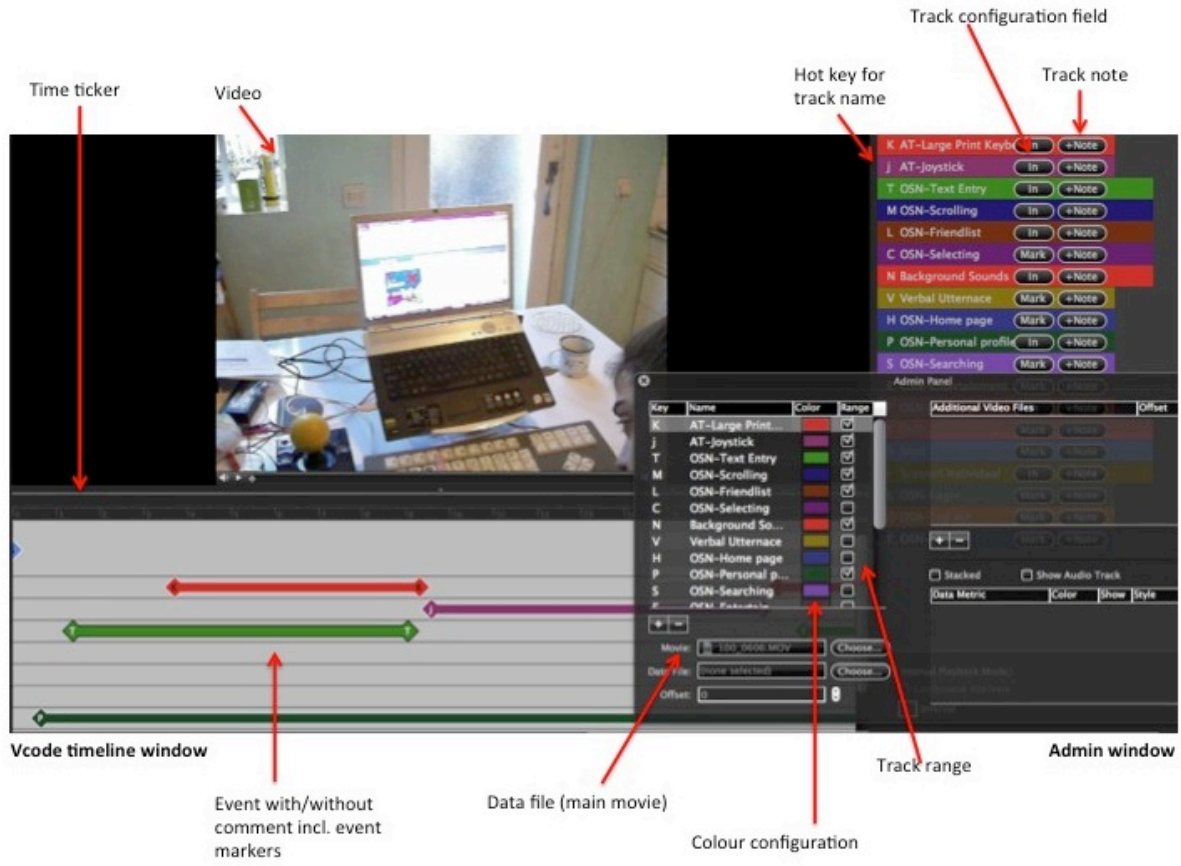


Figure 20. Vcode user interface.

ID	Marker	Description
A	AT device “Large QWERTY Keyboard”	Video marker where assistive technology is used, specifically a large QWERTY keyboard
B	AT device “Joystick”	Video marker where assistive technology is used, specifically a joystick
C	AT device “Screen Magnification Software”	Video marker where assistive technology is used, specifically screen magnification software
D	AT device “External computer mouse”	Video marker where assistive technology is used, specifically an external computer mouse
E	AT device “Screen Reader Software”	Video marker where assistive technology is used, specifically screen reader software
F	AT device “Word Prediction Software”	Video marker where assistive technology is used, specifically word prediction software
G	OSN “Text Entry”	Video marker where text entry occurs
H	OSN “Scrolling”	Video marker where user interface scrolling occurs
I	OSN “Friend list”	Video marker where the friend list page is visited
J	OSN “Selecting”	Video marker where user interface scrolling within the OSN occurs

ID	Marker	Description
K	OSN “Home page”	Video marker where the homepage page is visited
L	OSN “Notifications”	Video marker where the notification section is visited
M	OSN “Personal Profile”	Video marker where the personal profile page is visited
N	OSN “Searching”	Video marker where searching within the OSN occurs for example searching for friends and/or groups
O	OSN “Friend Profile”	Video marker where a friend profile page is visited
P	OSN “Log in”	Video marker where the log in page is visited
Q	OSN “Log out”	Video marker where the log out page is visited
R	OSN “Email”	Video marker where an external email provider is visited is visited
S	OSN “Messages”	Video marker where the messages page is visited
T	OSN “Wall”	Video marker where the participant or their friends wall is visited
U	OSN “Status Update”	Video marker where the status update section is visited
V	OSN “Chat”	Video marker where the chat feature is visited
W	OSN “Newsfeed”	Video marker where the newsfeed page is visited
X	OSN “Friend Suggestion”	Video marker where the friend suggestion page is visited
Y	OSN “Friend Invitation”	Video marker where the friend invitation page is visited
Z	OSN “Item Deletion”	Video marker where an item deletion occurs for example participant deletes a post from their wall
AA	OSN “Problem”	Video marker where a problem within the OSN occurs for example looking for a button after an OSN change occurs
BB	Support Individual Intervention	Video marker where the participant support individual intervenes in the observation session for example to help or carry out care
CC	Verbal Utterance	Video marker where the participant says something
DD	Background Sound	Video marker where excessive background sounds and/or conversations are heard
EE	External Website	Video marker where participant interacts with an external website for example google search
FF	Browser Feature	Video marker where participant interacts with browser for example bookmarks or forward and/or back buttons
	Computer User Interface	Video marker where participant interacts with the computer user interface for example search menu
GG	OSN “Event”	Video marker where the events section is visited
HH	Start	Video marker where the observation starts
II	End	Video marker where the observation ends

Table 12. Marker list.

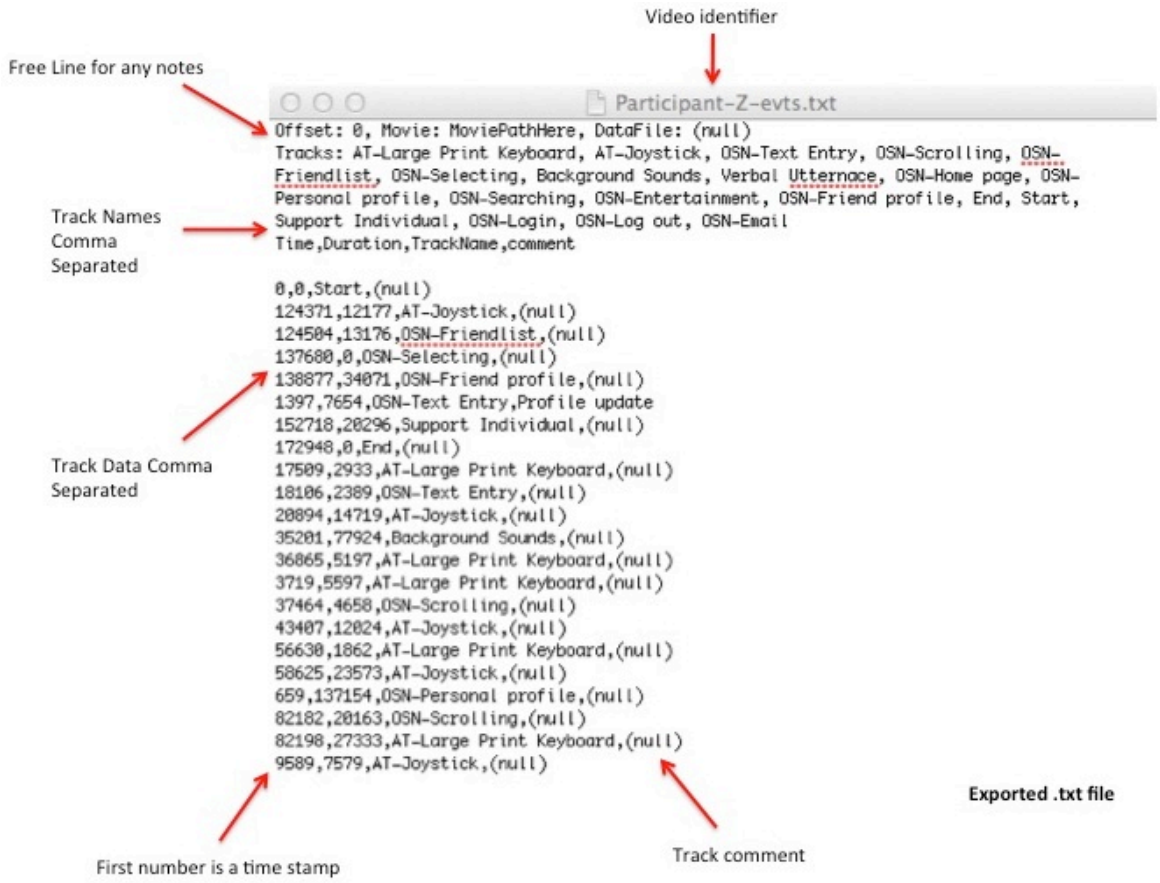


Figure 21. Example of an event log (see appendix b section b.2.1 for sample data).

4.3.6.1.2 Photographs and illustrations

The photographs and illustrations from the observation sessions (notes sheets (see appendix a section a.2.7)) were exported as electronic .JPEG files. The files were assigned to each participant observation session and reviewed repeatedly to aid familiarisation. The .JPEG were then used to report the findings, specifically the location of OSN use and AT device required (see section 4.4.1 and 4.4.2 for examples).

4.3.6.1.3 Interviews

Similarly to study one (see section 3.3.8.1), the post observation interviews were transcribed verbatim. The audio recordings were primarily used but there were instances where the video recordings were required to assist the process (see chapter 3 section 3.3.8.1). The raw data files were presented in a common format for example .doc files, with a margin of 2.0 respectively, using font Times New

Roman size 10, and exported to qualitative observation field notes software (TAMS Analyzer v4.00) (see figure 36).

Additionally each participant was given a unique identifier, their responses were highlighted, and line numbers added. The files were assigned to each participant observation session and reviewed repeatedly to aid familiarisation.

Due to the short nature of the interviews, from 1 minutes 41 seconds to 3 minutes 2 seconds, coding was not used. The interviews were reviewed (close reading of text) repeatedly to aid familiarisation. Key quotations that supported the videos, photographs and illustrations were identified (marked using TAMS Analyzer v4.00 (see figure 37)). The quotations were then use to support the findings (see section 4.4.2 for an example and appendix b section b.2.2 for sample data).

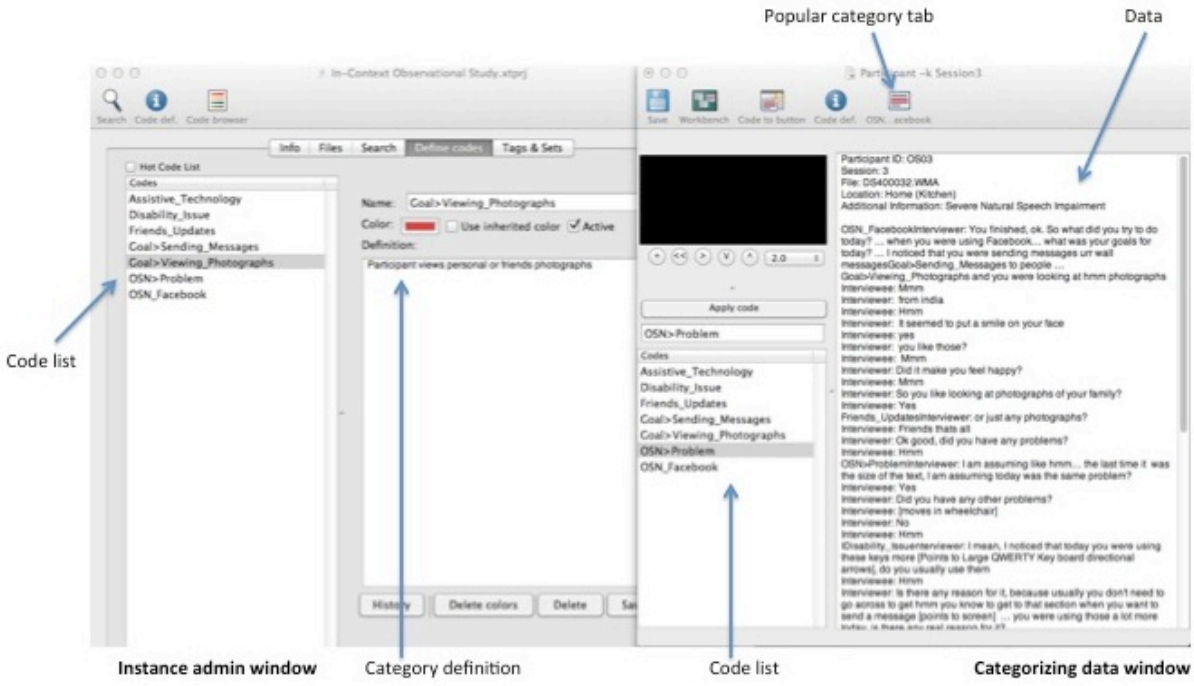


Figure 22. TAMS Analyzer user interface.

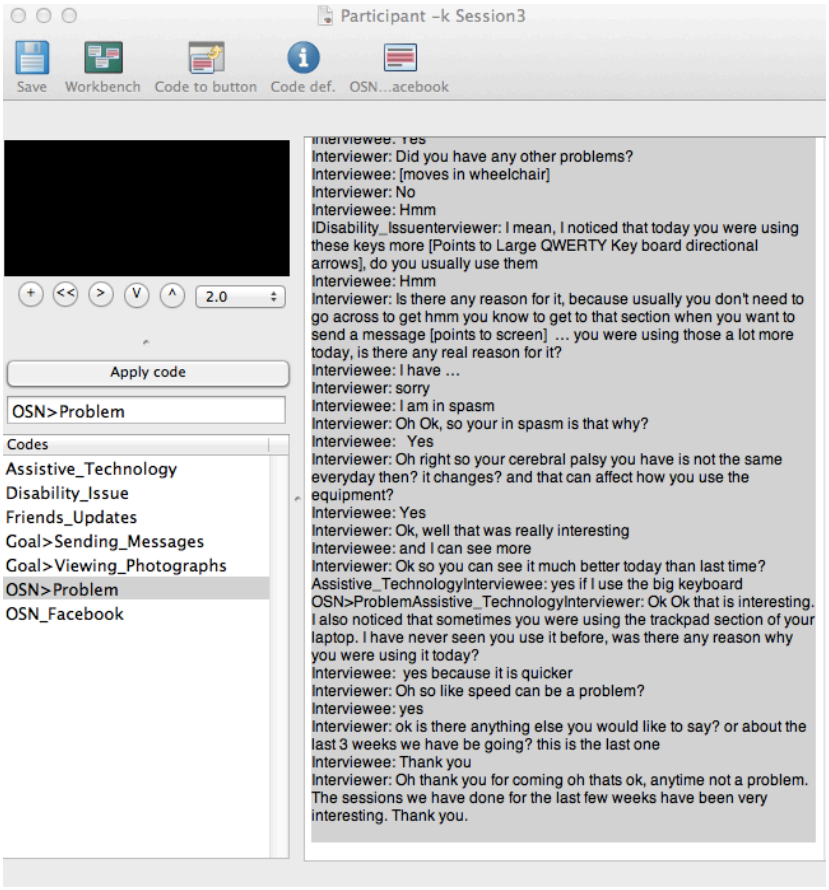


Figure 23. Marked interview data in TAMS Analyzer (see appendix b section b.2.2 for sample data).

4.4 Findings

This section will discuss the findings specifically location, equipment and AT devices, help and support and tasks.

4.4.1 Location

The participants from the study only used Facebook, this reiterated the findings from study one (see section 3.4.3). Furthermore the study found that participants in the study predominately use Facebook in large spaces that can accommodate large AT devices (hardware and software) (see section 4.4.2 and table 13). These spaces include living rooms (see figure 34 and 36), kitchens and dining rooms (see figure 37 and 38), large bedrooms, open areas within studio apartments (see figure 41) and altered workspaces (see figure 42 and section 3.4.3.1). The study also found that participants in the study only

use OSNs from fixed locations due to external AT devices required for example joysticks, large QWERTY keyboards (see section 4.4.2).

This aspect of the study produced results that further corroborated the findings from the exploratory interview study and work by Manna (2005) and Belchiorb et al (2005) who reported that 46.7% (age under 60 years) and 47.5% (age over 60 years) used workstation adaptions, additionally Pilling (2004) reported 15 out of 65 participants used AT devices (see chapter 3 section 3.4.1.7). However these studies did not specify the type of AT devices used. The study also verified that AT devices used impact the location of OSN use.

ID	Session 1 Location	Session 2 Location	Session 3 Location
OS1	Home: Living Room	Home: Living Room	Home: Living Room
OS2	Home: Kitchen	Home: Kitchen	Home: Kitchen
OS3	Work: Office	Home: Open studio	Home: Communal living room
OS4	Home: Dining Room	Home: Dining Room	Home: Dinning room
OS5	Home: Bedroom	Home: bedroom	Disability Centre Communal ICT space
OS6	Work: Office	Work: Office	Work: Office
OS7	Home: Bedroom	Home: Bedroom	Home: Bedroom

Table 13. Observation session locations.

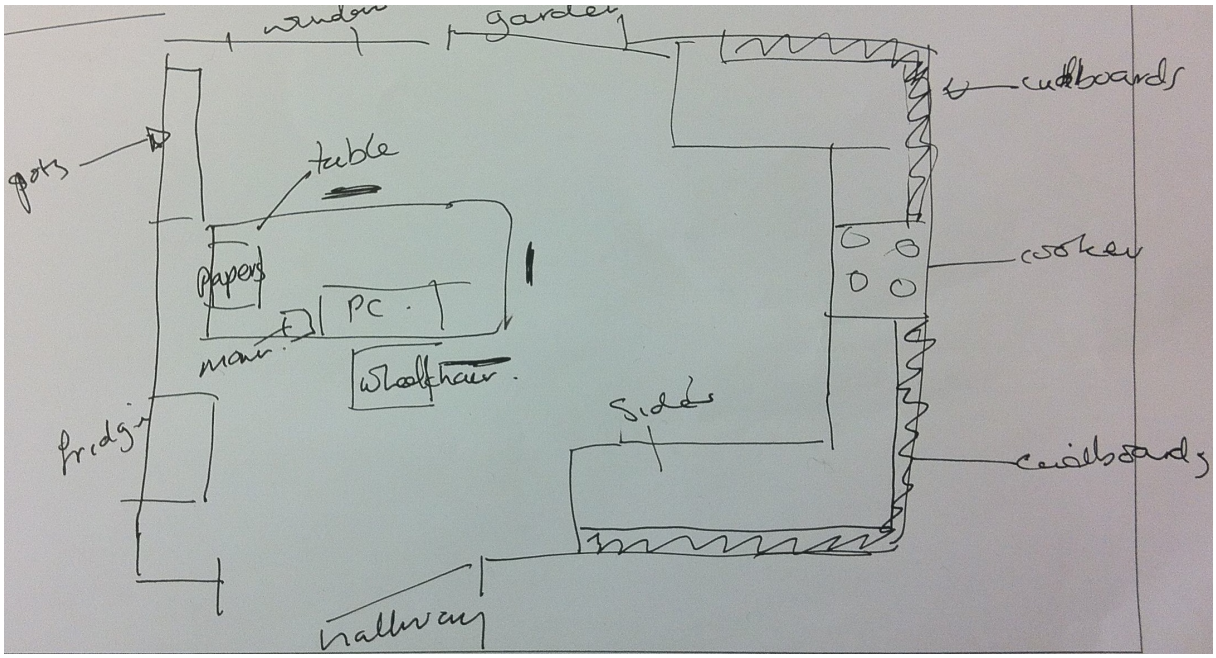


Figure 24. Participant computer setup: living room (illustration).

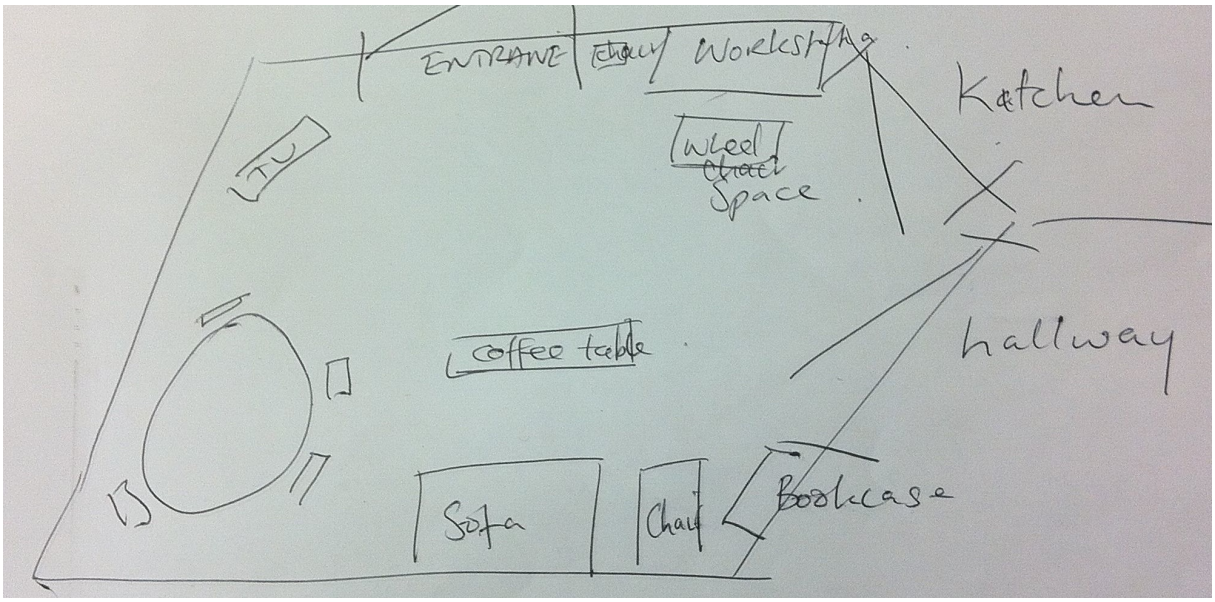


Figure 25. Participant computer setup: living room (illustration).

4.4.2 Equipment and assistive technology

The study found that most participants in the study require AT device to use OSNs. Seven out of eight participants used AT device, these included large print keyboard (see figure 37 and 38), joy stick (see figure 37), laptop adjustment devices (see figure 37 and 38), screen magnification software (see figure 37), external computer mouse (see figure 38), and screen reader and word prediction software (see section 2.4 for descriptions and further examples). This aspect of the study produced results that further corroborated the findings from the exploratory interview study (see section 3.4.1.5).

Additionally the study found that not all AT devices were used. For example one participant had access to a trackball and a screen reader but reported non use due to a lack of confidence, knowledge and skills (see figure 39). The participant observed described:

> **Example 1:** "I have these two things [participant points to AT devices]... my OT gave them to me, she said they would help but I don't know [participant looks at them] ... I'm not sure what they are for. I don't want to be a bother to her because she's busy so I don't use them"

The study found a correlation between the severity of the impairment presented by cp and the level of AT devices required (see section 2.3.2 for cp impairment description and section 2.4 for AT device allocations). For example a participant presenting less severe upper limb cp used limited or no AT device (see figure 38) whilst a participant presenting moderate or above upper limb cp used significantly more AT device (see figure 37). This aspect of the study produced results that further corroborated work by Disability Solutions (1998) that identified that one individual with cp may not require AT device whilst another may require low-tech AT devices, for example keyboard guards, another requiring medium-tech AT devices, for example computer screen readers, or another requiring high-tech AT device, for example AAC devices.

Figure 26. Participant using a joystick, large QWERTY keyboard, laptop adjuster, UI zoom software. The participant was also using screenreader software (video still).

Figure 27. Participant using a laptop with external mouse and large QWERTY keyboard (video still).

Figure 28. Participant using a laptop with no AT device technologies attached. The participant had access to a external monitor, screen magnification software and a trackball (photograph).

Figure 29. Panorama of participant wide workstation including desktop computer, printer, large QWERTY keyboard and external mouse (stitched photograph).

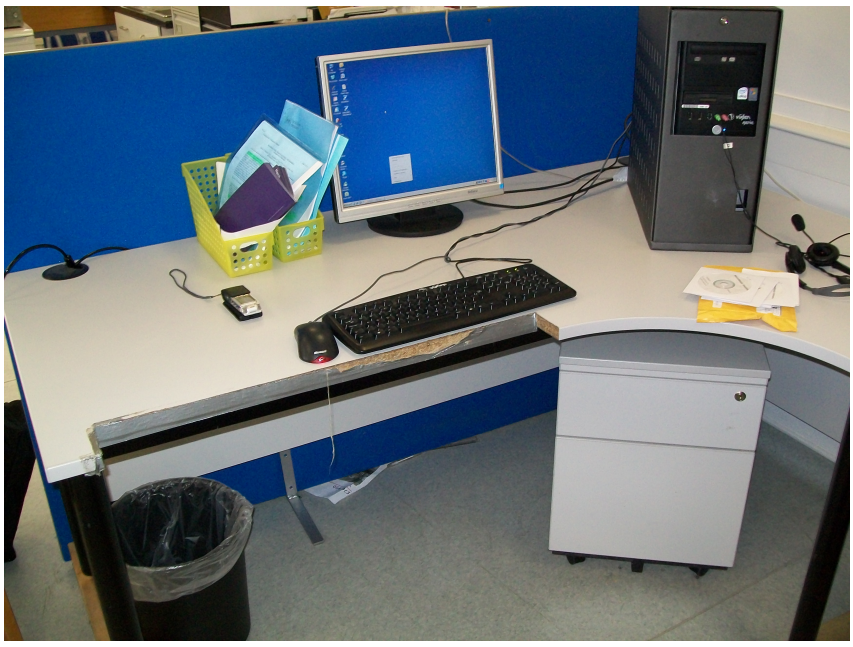


Figure 30. Participant workstation, a section of the desk has been removed to accommodate participant wheelchair (photograph).

4.4.3 Help and support

The study found that participants in the study require support to use OSNs specifically Facebook. This included support to set up AT devices required; use OSNs for example logging in and logging out; and help to overcome OSN issues. This aspect of the study produced results that further corroborated study one (see section 3.4.1.5) and Ellis and Kent (2010) that looked at individualisation and pathologisation of disability. The research suggested that such an instance where an individual requiring help to interact with an OSN has been shown throughout history, i.e. these individuals being given the helper position, is unacceptable and that OSNs should foster independence rather than benevolent assistance (see chapter 2 section 2.5). This was further echoed by Marshall et al (2007) who looked at support individuals for OSN users with cognitive impairments. The research found that these individuals are often seen as authority and there presence can impact on OSN use (see chapter 2 section 2.5.2). Furthermore the study found that support individuals are often present when interaction with OSN occurs. Ten of the twenty-one observation sessions a support individual was present. During six observation sessions the participant support individual was close enough to view OSN interactions (see figure 44 and 46 for examples).

Figure 31. Participant support worker observing his interactions (video still).

Additionally the study found that changing OSNs often caused support individual intervention. This aspect of the study produced results that further corroborated exploratory interview study (see section 3.4.3.4). For example one participant required a support individual to enter text into Facebook messages (see figure 45). This was due to a Facebook user interface and task structure change that reduced the participant independent communication. This caused the participant to become frustrated and angry. The participant observed described:

> **Example 2:** [Observation session] "What's going on? this is different"
>
> **Example 3:** [Observation session] "Can you help me [support individual name] it's different I need to send a message"
>
> **Example 4:** [Observation interview] "There was one problem it was big... Facebook changed again... I couldn't see how to send a message. I had to ask [support individual name]"
>
> **Example 5:** [Observation interview] "I want to write for myself not [support individual name] for me"

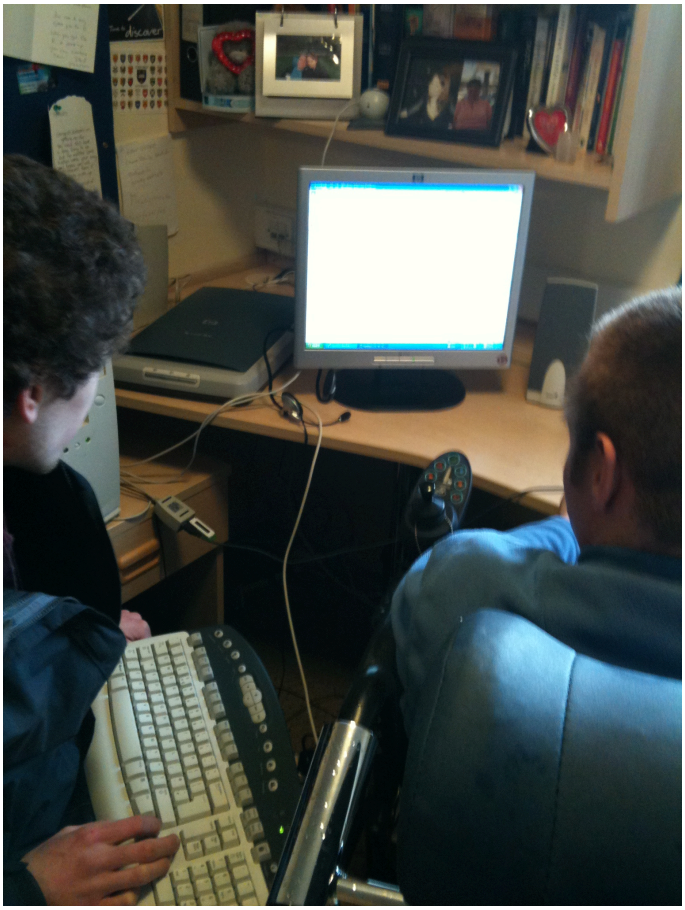


Figure 32. Participant support worker carrying out text entry on behalf of participant (video still).

Additionally the study found that changing OSNs was not restricted to the above example, four participants also reported this as an issue. One participant stated this whilst searching for the log out button (see figure 53) and during the observation interviews three participants described:

Example 6: "Facebook changed again, why do they do this it was confusing"

Example 7: "I couldn't find the log out button, it was over there before [participant points to user interface] that's stupid"

Example 8: "That new like button is really small, I don't like that"

Figure 33. Participant using ISG with support worker present (Video still).

This aspect of the study produced results that further corroborated exploratory interview study (see section 3.4.3.4) and established the inhibiting effect that changing OSN, specifically Facebook, has for adults with cp.

4.4.4 Tasks

The study found that participants in the study were using OSNs, specifically Facebook, to communicate with family members and friends. They predominately communicate via public and private messages (see figure 47, 48 and 50), and were concerned with what family members and or friends were doing (see figure 47 and 49). They are also regularly checking their Facebook notifications (i.e. friend and application requests), searching for friends and disability groups (see figure 48 and 51); and use within-website chat (see figure 51) to elicit communication. This aspect of the study produced results that further corroborated exploratory interview study (see section 3.4.3.2) and work by Consumer Expert Group (2009) which indicated the Internet can allow more independence because they allow individuals to stay in touch with friends and family members more easily

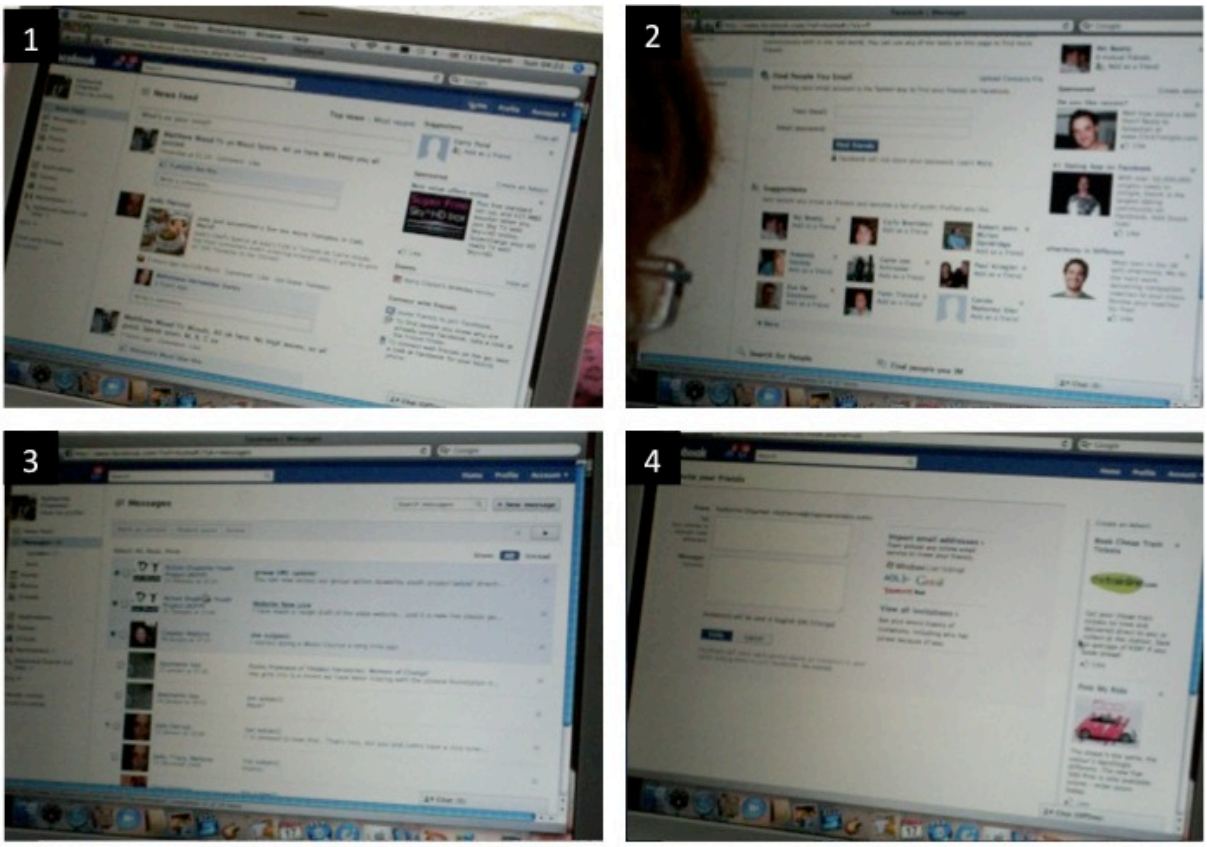
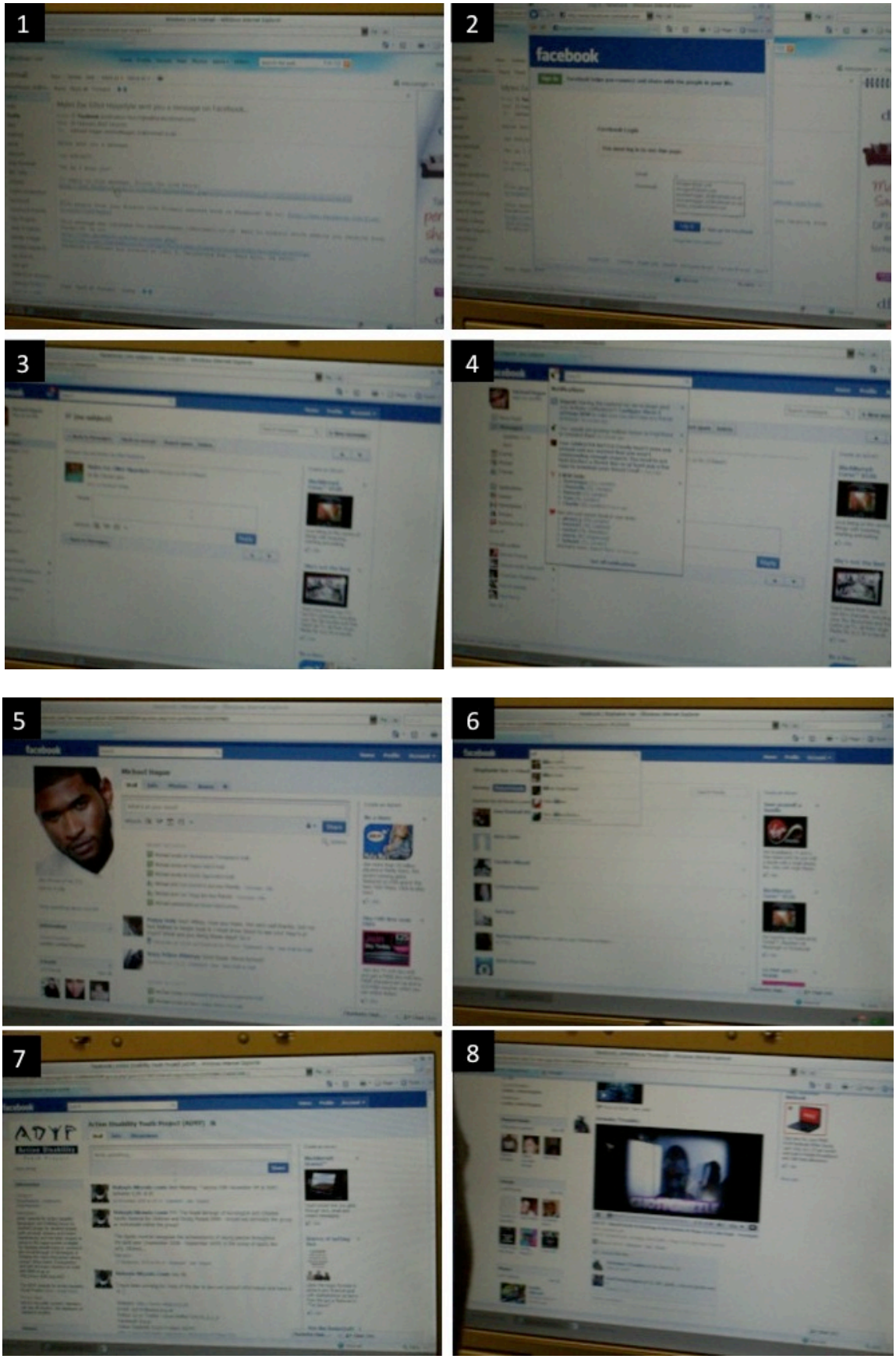


Figure 34. Participant interacting with Facebook: 1) extensively viewing the newsfeed; 2) looking at Facebook friend suggestions; 3) viewing messages from disability clubs and family members; 4) inviting a new friend whom the participant met at a disability centre (video still).


1
2
facebook
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ADYP
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Figure 35. Participant interacting with Facebook: 1) logging into Windows Live Mail to read Facebook messages; 2) Participant decided to respond so clicked on the link opening Facebook, participant had problems logging in taking multiple attempts; 3) Responding to message from a friend; 4) Participant notices awaiting notifications and read them 5) Participant viewing personal profile page checking all public messages, deletes items felt to be inappropriate; 6) Participant searching for a disability centre profile page; 7) Participant reads recent posts on disability centre profile wall; 8) Participant searches for friend (see image 6) read through Newsfeed and watches an embedded YouTube video (video still and event logger).

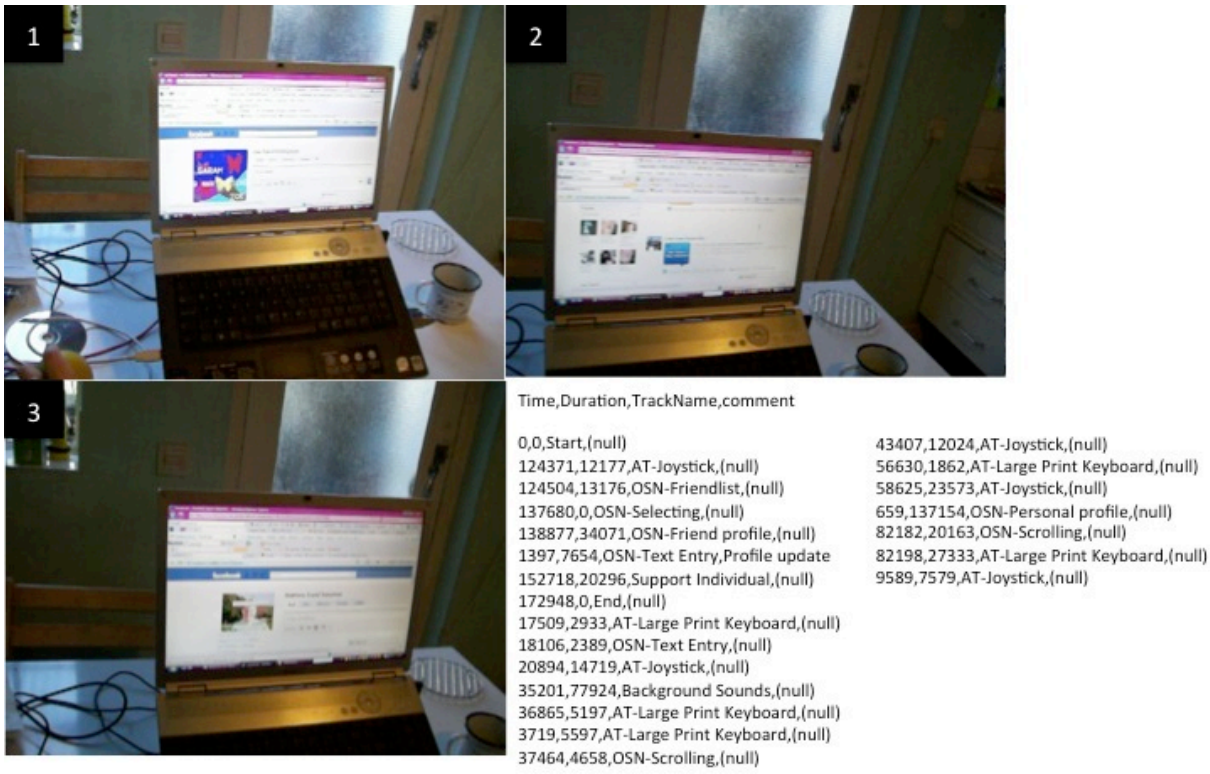


Figure 36. Participant interacting with Facebook: 1) Participant viewing personal profile page checking wall; 2) Participant reading friend list; 3) Participant reads friend profile (video still and event logger file).

Similarly to exploratory interview study (see section 3.4.3.4) during the study OSN Facebook underwent a user interface change specifically the location of key buttons including log out and introduction of a comment “like” button. As a result most of the participants had issues with the change. For example one participant found the small size of the like button difficult to interact with (see figure 52 photograph 1) resulting in the participant moving towards the monitor (see figure 52 photograph 2).

Another participant struggled for 9 minutes 40 seconds searching for the log out button (see figure 53) and became highly frustrated and concerned about her privacy i.e. whether she had logged out successfully. This aspect of the study produced results that further corroborated exploratory interview study though offered an example of such frustration concerning OSN change.The participant observed described:

Example 9: [Observation session] “It’s changed... Where is the log out it used to be here [participant points to user interface] it’s not that can you see it? [participant looks at researcher] it was there what should I do [participant looks at researcher] will my information be safe if I close the page? [participant looks at researcher] I am worried, I should turn the computer off to make sure [participant turns off the computer]”

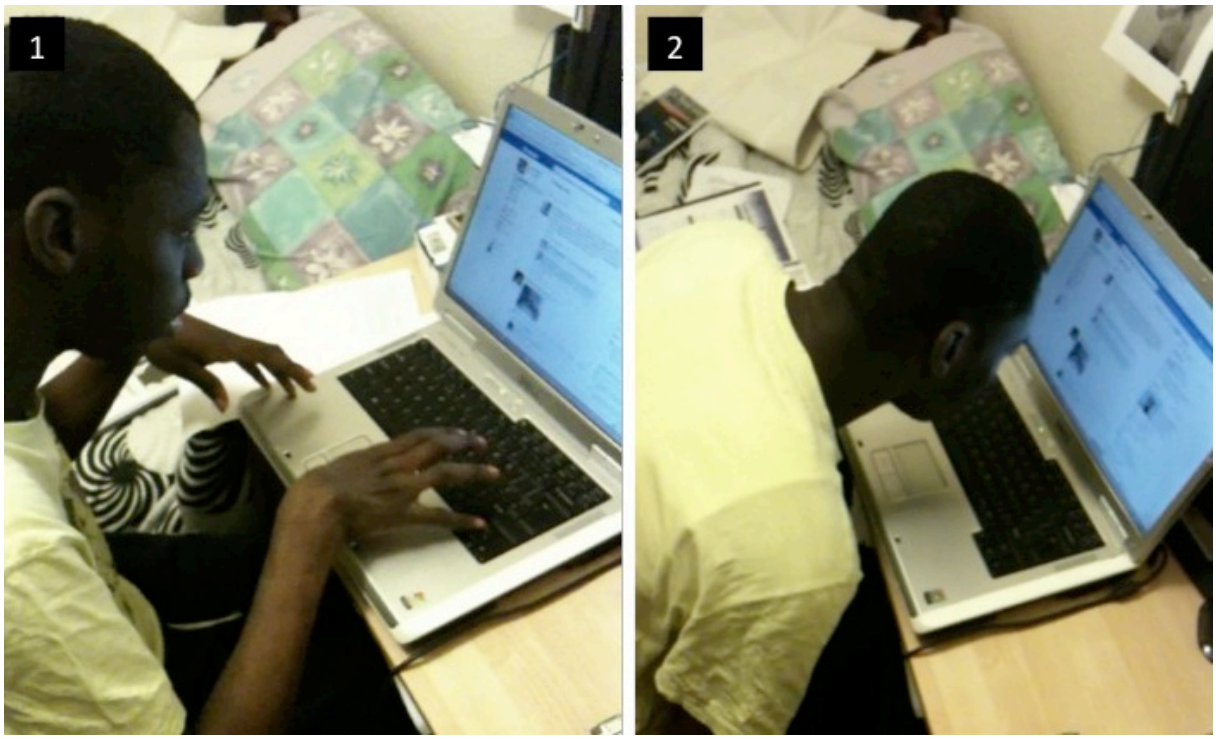


Figure 37. Participant struggling to interact with new like button causing the participant to lean towards the monitor (video still).

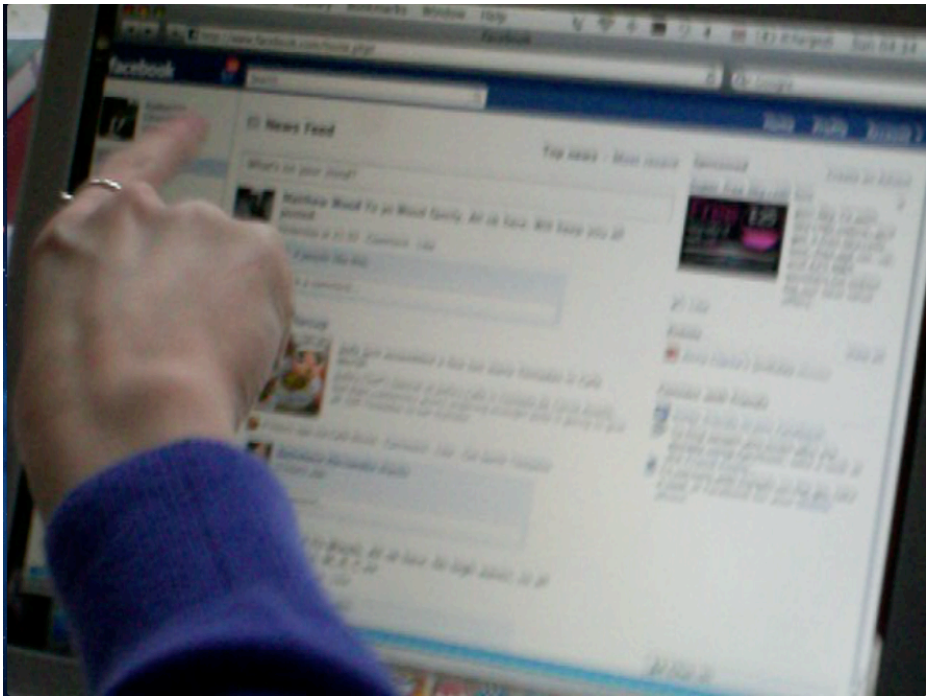


Figure 38. Participant struggling to find Facebook log-out button after UI change. Participant indicating button previous location (video still).

Finally the study found that participants in the study with severe upper limb impairments took longer to interact with OSN especially when responding to messages. One participant used Microsoft Word in-conjunction with a joystick, large QWERTY keyboard, laptop adjuster, screen magnification software (see figure 37). The participant copied and pasted messages into Microsoft Word, participant enlarged it to font size 120 and colour purple for easier viewing. The participant then used these settings to respond in Microsoft Word. The participant then copied the response into Facebook and sent the message (see figure 54). This aspect of the study produced results that further corroborated exploratory interview study specifically that long and complicated tasks slowed down or prevent their communication (see section 3.4.3.4). This aspect of the study did not produce results that further corroborated other HCI work.

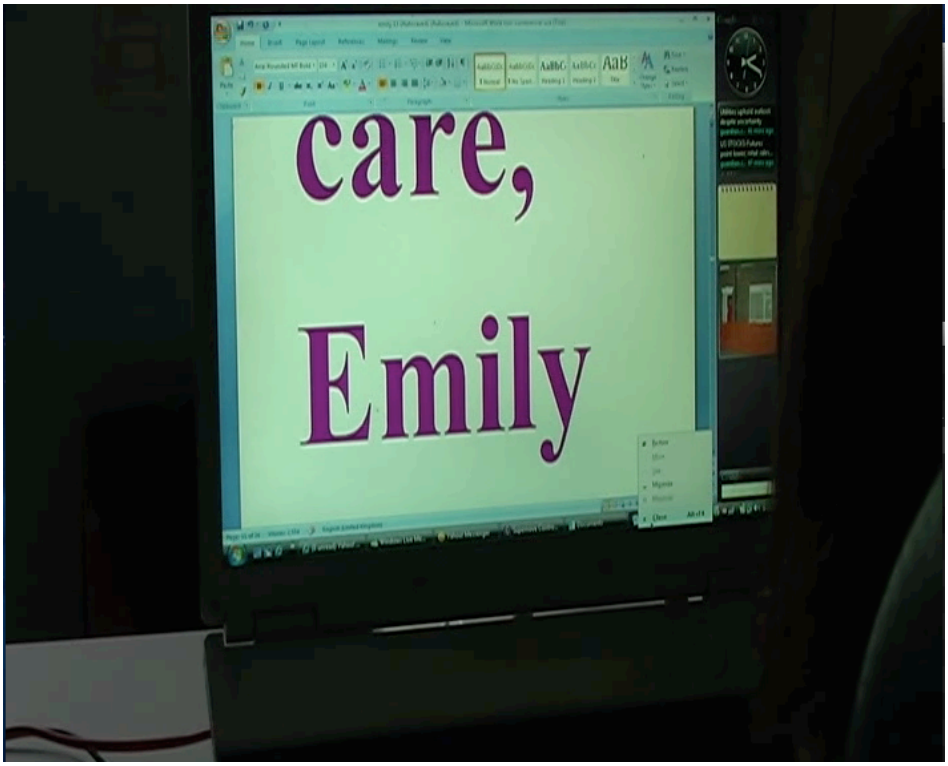


Figure 39. Participant using an extend method to respond to messages (video still).

4.5 Discussion

The exploratory interview study successfully answered research questions one and two (see chapter 1 section 1.4). However due to the method used some participants especially those with natural speech impairments or AAC devices could not fully describe their OSN use without assistance from a support individual (see section 3.4.3.5 example 8 and 9). This was believed to be inappropriate due to the fact that this study aimed to explore OSN experiences and challenges directly from OSN users with cp.

As a result a follow on study, an in-context observational study, was carried out. This allowed OSN users with cp to independently demonstrate their OSN use and AT devices used, the tasks they carried out and their feelings during the interaction without external influences.

Twenty-one observational sessions were carried out with seven participants with different types of cp and who used OSNs. The observations took place over a three week period and each participant was observed three times. The observation sessions lasted up to 30 minutes. The participants were observed while using their chosen OSNs followed by a short interview.

Videos, photographs, illustrations and interview transcriptions were gathered (see chapter 4 section 4.3).

The study found that participants only use Facebook. The OSN was used in large spaces that can accommodate large AT devices. These spaces include living rooms, kitchens and dining rooms, large bedrooms, open areas within studio apartments and altered workspaces. The study also found that adults with cp only use OSNs from fixed locations due to their AT devices.

Additionally the study found that most adults with cp require AT devices to use OSNs. Such devices include large print keyboards, joysticks, laptop adjusters, screen magnification software, external computer mouse and screen reader and word prediction software.

The study also found that not all AT devices are used due to a lack of confidence, knowledge and skills. The study also identified a correlation between the severity of the impairment presented by cp and the level of AT devices required. For example adults presenting less severe upper limb cp used limited or no AT devices whilst adults presenting moderate or above upper limb cp used significantly more AT devices. Additionally Magee et al (2011: 242) reiterated this PhD research (Lewis, 2010) stating that:

> "Social isolation and loneliness are important challenges faced by people with certain physical disabilities. Technical and complexity issues may prevent some people from participating in [OSNs] that otherwise may address some of these issues".

The research puts forward an AT device that generates OSN messages automatically using AAC devices. Magee et al (2011) believed that the messages would help users with physical disabilities to post their daily activities within the software to OSNs. Thus helping to improve engagement and interaction between OSN users with physical disabilities and their friends, family members and caregivers. Magee et al (2011) also stated that this increased interest in OSN communication via AAC devices would led to the desire to use AT devices more fully.

Furthermore the in-context observational study found that adults with cp require support to use OSNs. This included help to set up AT devices and to overcome problems. The study also found that support individuals were often present when interaction with OSNs occurred. Ten of twenty-one observational sessions had a support individual present and during six observation sessions the support individual was close enough to view OSN interactions.

Additionally the study found that changing OSNs often meant participants required help from a support individual. For example one adult with cp required a support individual for text entry, this was due to a Facebook user interface change.

The study also found that participants were using OSNs specifically Facebook to communicate with family members and or friends. They were communicating via public and private messages primarily to ascertain what their family members and or friends were doing. They were also regularly checking their Facebook notifications, carrying out within-OSN searches, and using within-OSN chat facilities to elicit communication from their family members and or friends.

Finally the study found that participants with severe upper limb impairments due to cp took longer to interact with Facebook especially when responding to messages. Similarly to the exploratory interview study, Facebook underwent a user interface change and n=5 participants reported this was an issue. Therefore it appears that changing OSNs is an important facet for inhibiting OSN use.

The results from the in-context field observation study produced results that fully corroborated the findings from the exploratory interview study. These results were not influenced by an external party i.e. a support individual. Similarly to the exploratory interview study, the study did partially corroborate some findings of previous HCI work specifically the use of AT devices and reasons for OSN use (see chapter 3).

It is believed that this study added to the initial exploratory interview study therefore further validating the findings. As a result further answering research questions one and two: What is the current situation of online social network use among adults with cerebral palsy? What are the key inhibiting factors that prevent and or slow online social network use among adults with cerebral palsy?

4.5.1 Strengths

Similarly to the exploratory interview study, the study made this under represented community more visible. The observational method used offers a view of what OSN users with cp actually do in context. The study provides a visual narrative of OSN use specifically location, AT devices used and tasks carried out. It also provides a visual (real-life) glimpse of OSN change and the affects it can have on users with cp.

4.5.2 Weaknesses

The study presented two key weaknesses:

1. The observational study did not include specific tasks i.e. participants were not asked to do or explore specific areas within their chosen OSN. This meant that the findings did not represent OSN features in their entirety or show task variety. As a result the findings appeared incomplete and or uninspiring. However the purpose of the study was to observe what OSN users with cp actually do in context without external influences, which the study successfully achieved (see chapter 10 section 10.2 for future work that could overcome this limitation).

2. The observational study did not report OSN content i.e. who participants were talking to and the content of their interactions. Though this was observed it could not be reported due to City University London ethics restrictions specifically the non-public nature of Facebook profiles. The participants provided consent to view their OSN account but consent could not be obtained from those they interacted with, therefore detailed information on these interactions and or conversations could not be reported.

As a result of the weaknesses of the study the findings reported should be viewed as a form of validation for the exploratory interview study. Furthermore a literature review was carried out that explored OSN change. As a result it was determined that changing OSNs has not been represented adequately within HCI literature (see chapter 2 section 2.6). Therefore a follow-up study that explored

how an OSN change is deployed, its effect on users, and the factors that encourage change acceptance and non-acceptance was carried out.

Chapter 5 – Study Three: Longitudinal Twitter monitoring and analysis

5.1 Introduction

The first study, an exploratory interview study (see chapter 3), identified the reasons for use and non-use of OSNs by people with cp and also key themes including independence, privacy, trust, and change, together with challenges such as slow input speed, poor user interface features, lengthy and complicated tasks, lack of user interface personalization and unavailable or inappropriate within-website help.

As a result of the method some participants especially those with natural speech impairments or that used AAC devices could not fully describe their technology use without assistance from their support individual. This resulted in a follow-up study, an in-context observational study (see chapter 4).

The study identified the OSNs and AT devices used, tasks carried out and users feelings during interaction. It was determined that changing OSNs prevent and or slows these users ability to communicate online whilst also not being represented adequately within HCI literature (see chapter 2 section 2.6).

To answer research question three how are OSNs deploying change? and four how are OSN users experiencing and accepting change? a longitudinal OSN monitoring and analysis study was carried out from 14 September 2010 to 28 February 2011.

The study identified how an OSN change is deployed, its effect on users, and the factors that encourage change acceptance and non-acceptance. The study investigated a real world example of OSN change by observing the actions of Twitter and its users reactions to the change from #OldTwitter to #NewTwitter.
Due to implacable timing, Twitter releasing a rapid restructure, this real-world example was chosen.

Additionally the OSN users with cp were not distinguishable within the data set. This was attributed to OSN users with disabilities rarely disclosing their impairment within the technology, this limitation is further discussed in chapter 10 section 10.3.

The study was divided into two parts:

- Overview of users reactions to change within Twitter user interface, this was done by investigating tweets that referenced the #NewTwitter hashtag during peaks,
- A more in-depth look at users reactions to change in Twitter over a 6-month period using an event-sampling method where the first 100 tweets mentioning #NewTwitter on Tuesdays were collected and analysed.

As a result a study summary was published in CSUN'12, DIS'12 and TCUK'12 (see appendix c section c.1 and c.6).

This chapter discusses the study background, study questions, method, organization of data, the findings for part one and two and study validation.

5.1.1 Background

In 2010 one of the most popular OSNs was Twitter, it was ranked as the third most used OSN and was known as SMS for the Internet. Twitter enables users to send and read messages called tweets, short bursts of inconsequential information, that are text-based posts of up to 140 characters (see figure 55). Users tweets are made public by default however users can restrict their visibility. Users can also subscribe to other users tweets, known as following and their subscribers are known as followers[14].

[14] A user who is being followed by another user does not necessarily have to reciprocate by following them back making the connections within Twitter directed.

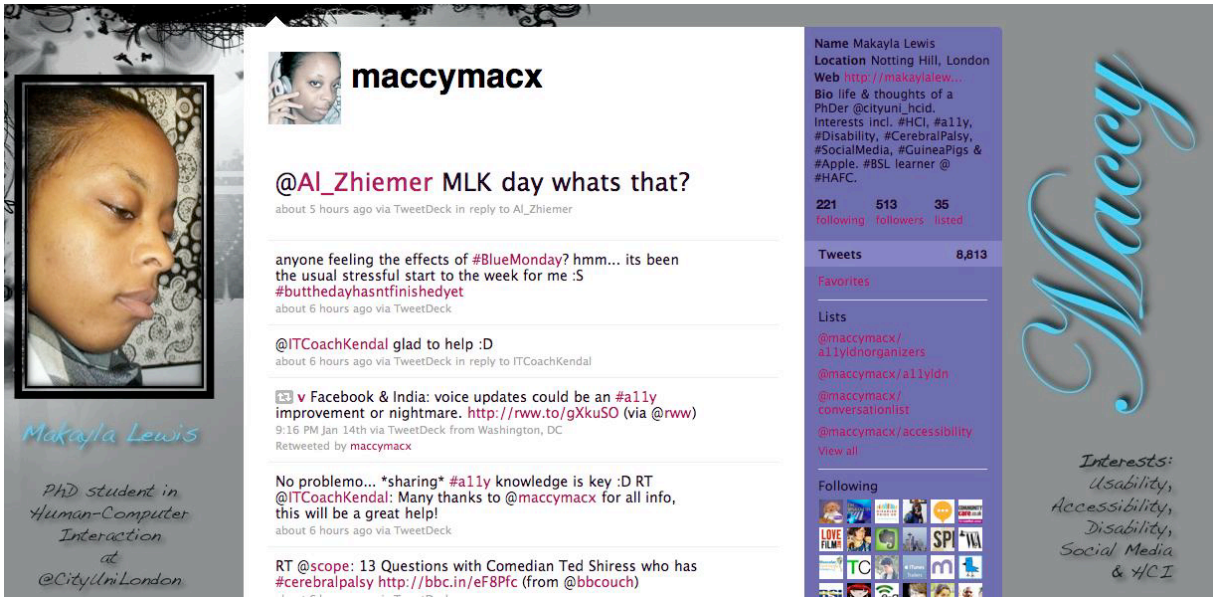


Figure 40. Old Twitter user interface (also referred to as #OldTwitter) (copyright has been granted)

Since Twitter launched in 2006 it had undergone minimal user interface changes (Twitter, 2010). From September 2010 through February 2011 Twitter began to roll out #NewTwitter, a completely overhauled user interface. This radical restructuring (see chapter 2 section 2.6.3.2) of the user interface and functionality included the ability to see pictures and videos without leaving Twitter itself by clicking on individual tweets that contain links to a variety of supported websites for example YouTube and Flickr. Additionally button locations for @mentions, Retweets, messages and log out were also adjusted (Twitter, 2010) (see figure 57). Whilst figures 55 and 56 offer screen shots of the change the view given is highly simplistic. Wirify (2010) was used to produce wireframes that exemplify the change (see figure 57).

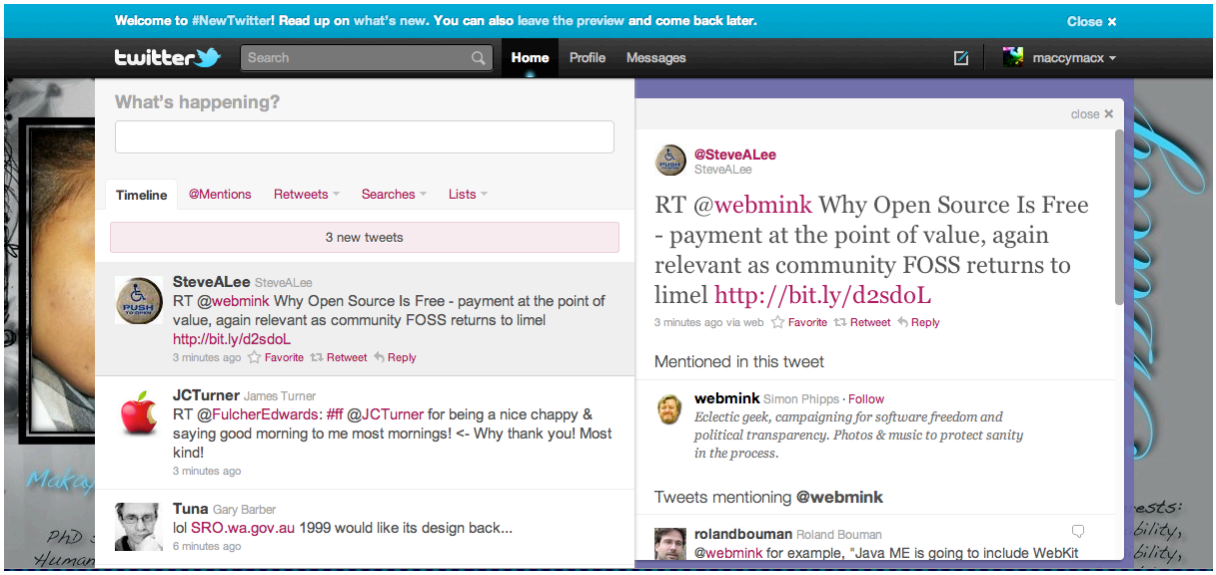


Figure 41. new Twitter user interface (#NewTwitter) (copyright has been granted).

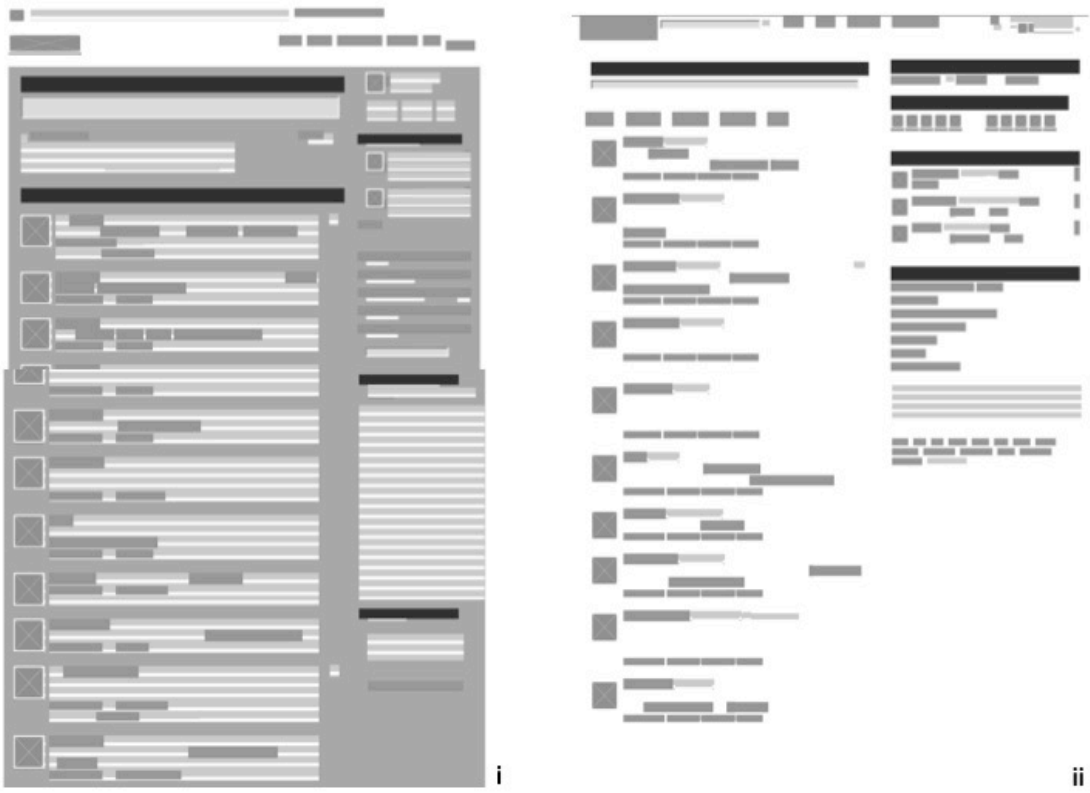


Figure 42. (image i) A wireframe of old Twitter user interface compared (Image ii) to new Twitter user interface (also referred to as #NewTwitter) (copyright has been granted).

5.2 Change approach

5.2.1 Timeline

Initially a timeline was developed that documented Twitter activities for example blog, help centre posts, Twitter profiles for example @twitter, @feedback, @support, and YouTube and Flickr subscriptions and media responses to Twitter actions (see figure 58 and 59). The timeline provided an external view of how Twitter progressed from the old user interface to the new user interface '#NewTwitter' (see figure 58).

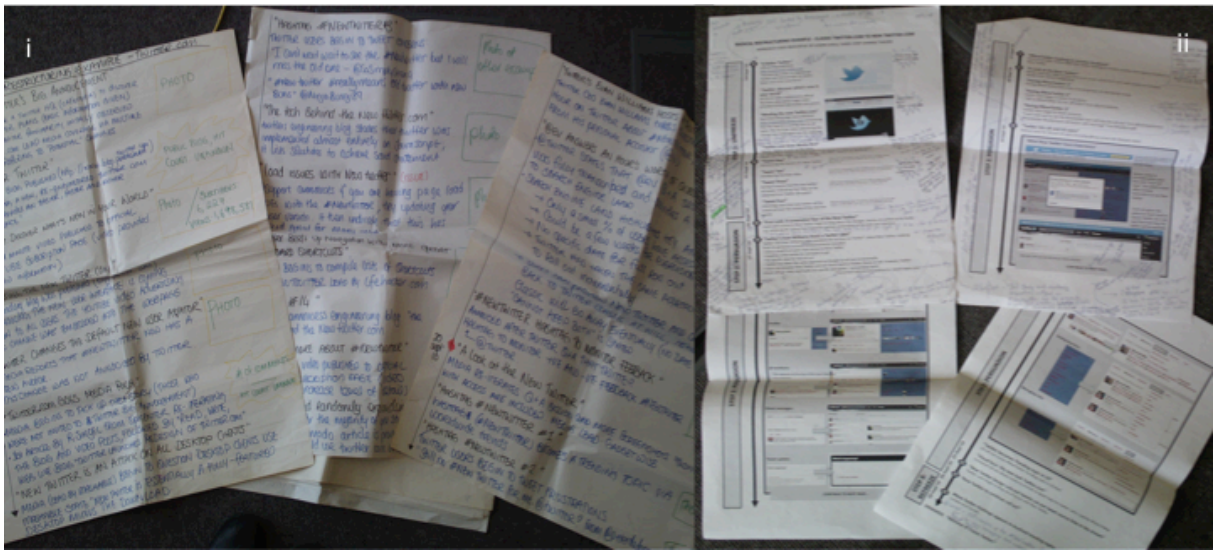


Figure 43. Developing timeline of new Twitter change approach using Flip-chart; ii) including change approaches and theories.

The timeline found that Twitter launched #NewTwitter on 14 September 2010. It began with a media launch at their headquarters accompanied by a blog post that provided a summary of #NewTwitter with a link to an advertisement on YouTube.

Tweets from Twitter accounts were also sent containing links to the blog, YouTube video and external media posts that covered the launch. The study found that Twitter did not offer knowledge of the change prior to the launch but continually sent tweets concerning the change from @Twitter and @Support. An additional account @Feedback was also created to allow users to offer opinions and

communicate problems. Twitter also encouraged users to use the #NewTwitter hashtag whenever they were tweeting about the new user interface.

The timeline found that not all users had access to #NewTwitter from the beginning and that full access did not occur until 11 October 2010. During this time Twitter continued to tweet about #NewTwitter. Twitter also hosted a question and answer (Q&A) session with its then CEO lasting 1 hour, to allow users to offer opinions or ask questions.

Following this a more in-depth advertisement and blog was launched that was accompanied by a help centre that contained answers to frequently asked questions. After the roll out users were given the option to use #OldTwitter or #NewTwitter and after a month(7 November 2010) engagement with users ceased.

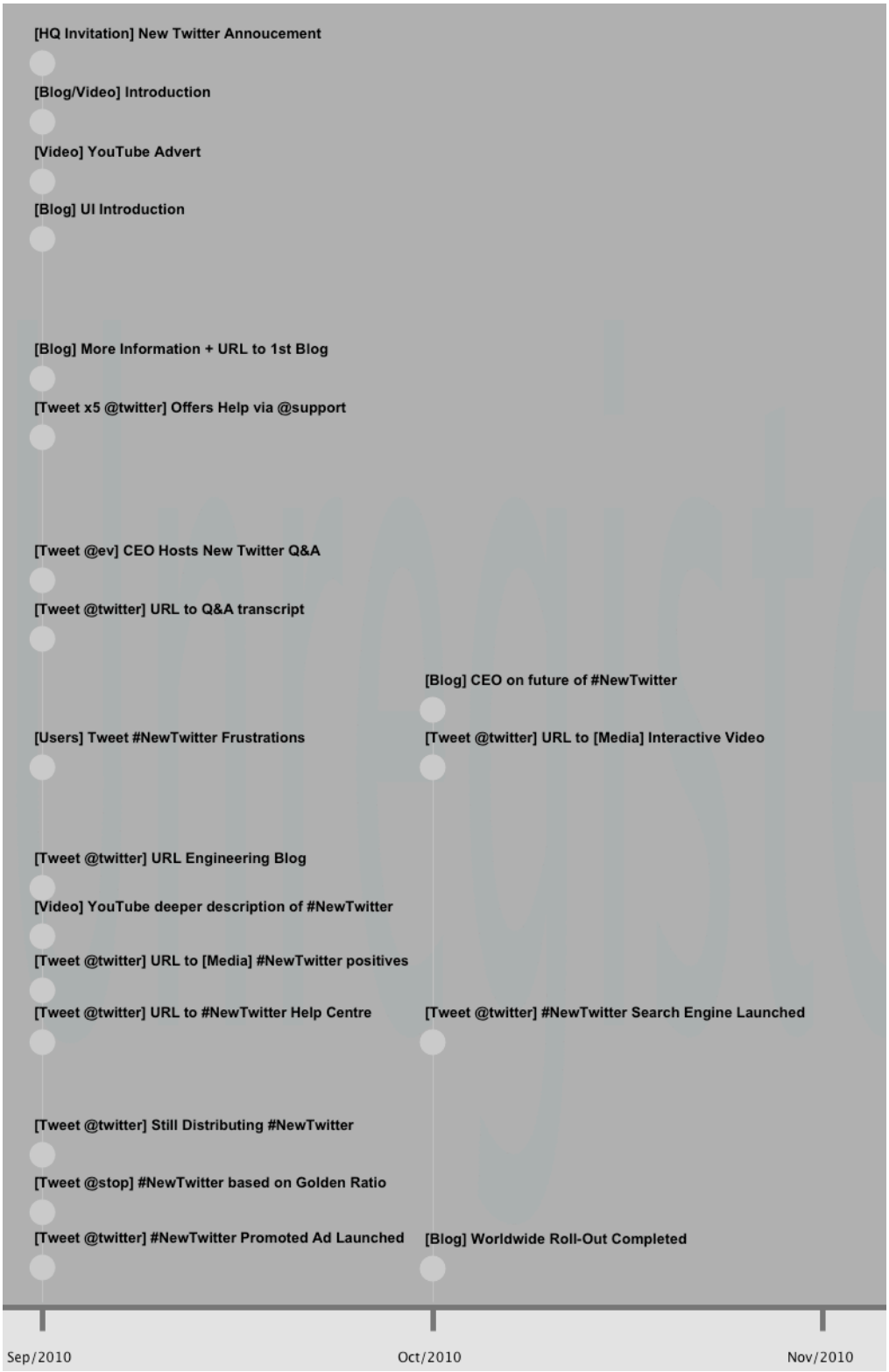


Figure 44. Summary timeline of Twitter change approach.

5.2.2 Change map

Using the timeline a Twitter change map was developed (see figure 60). The map considered Twitter activities before, during and after the change deployment. It also takes into account the change theories and approaches discussed in chapter 2 section 2.4.

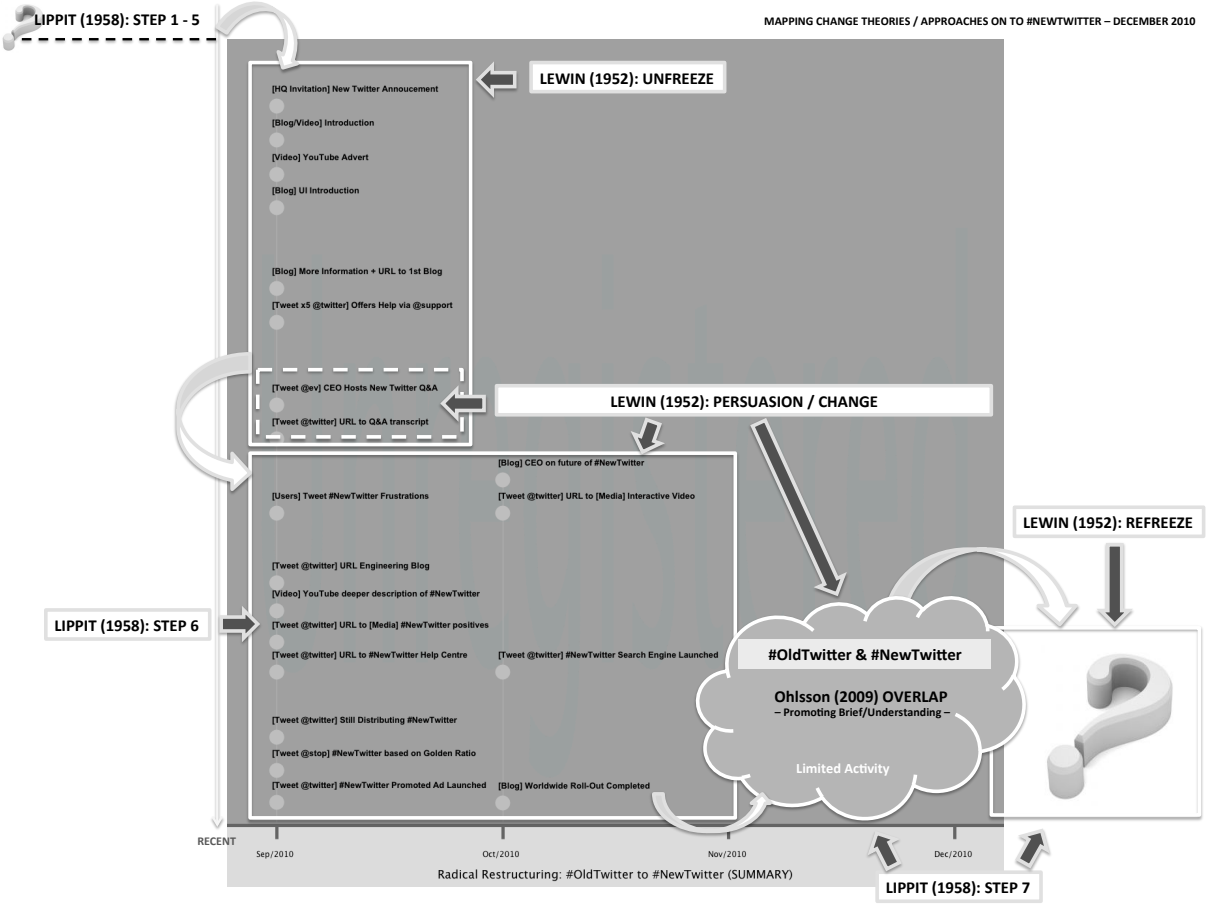


Figure 45. Mapping the change approach of #OldTwitter to #NewTwitter . The purpose of this image is to map potential approaches to the timeline, to view the timeline see figure 59.

The map found that Twitter's change process primarily draws on Lewin (1951) three-step model for change management but also calls on Lippit (1958) seven-stage change management model. However, as only external observations could be made, only steps 1 to 4 of Lippit's (1958) model were observed.

Additionally it appears that Lewin(1951) persuade step was extended to consider Ohlsson(2009) definition of conceptual change i.e. overlap, users belief and understandings of both interface points, could also be observed as users were given the opportunity to switch between #OldTwitter and

#NewTwitter. Furthermore it was determined that Lewin (1951) refreeze step was not evident during the time.

It must be made clear that the theories and approaches identified are based on the researchers external observations of Twitter actions during 14 September 2010 to 28 February 2011, these observations could not be verified by Twitter.

5.3 Part one: peaks

The change map offers an understanding of Twitter change approach, however the change map does not identify Twitter users experience or acceptance of the change. Thus failing to answer research question four how are OSN users experiencing and accepting change? (see chapter 1 section 1.4). To answer this a Twitter monitoring and analysis study was carried out.

5.3.1 Study questions

The study questions addressed were:

1. When do peaks for mentions containing #NewTwitter hashtag occur?
2. What were the actions of Twitter during the peaks?
3. How do users react to Twitter actions?
4. Why do peaks for mentions containing #NewTwitter hashtag occur?
5. How do users react to the change process deployed by Twitter?
6. How has the change from #OldTwitter to #NewTwitter been accepted by Twitter users?

5.3.2 Method

5.3.2.1 Defining population of concern

In 2010 Twitter had 106 million users and from January to August 2010 new users accounted for nearly 44% of the total population . These users (62.14%) were located within U.S. however users

within U.K., Canada and Australia were gradually increasing their use: 7.87% (London), 5.69% (Toronto), 2.8% (spread-out) respectively . 76% of these users, 52% women and 48% male, were university students between 26 to 44 years old and have a mean age of 31 (Helpburn, 2010) .

These users were amassing 50 million tweets every day however this is attributed to 1.113% of users, who tweet more than 10 times a day (Sysomos, 2009). The majority 85.3%, of users tweet less than once per day whilst 50.4% had not updated their status in the last seven days and 80.6% have made fewer than 500 tweets (Sysomos, 2009). Tweets were sent through a variety of methods: more than 55% of users tweet through something other than Twitter (45.7% web, 19.70% TweetDeck, 4.5% TwitterFon, 3.8% TwitterFeed, 3.7% Tweetie Twitter for iPhone (Sysomos, 2009)). 40% of tweets originate from mobile devices such as laptop, mobile phone, game console, tablet, or e-reader .

The content of these tweets was often divided into 6 categories: pointless babble (40%), conversational (38%), pass-along value, sharing information or web addresses (9%), self-promotion (6%), spam (4%) and news (4%) (Sysomos, 2009). These tightly connected topical or shared interest communities (Sysomos, 2009 and Jave, et al 2007) that were founded through a shared hashtag for example. #cerebralpalsy is the preferred hashtag for Twitter users who have an interest in cp.

5.3.2.2 Sample frame

Research.ly 1000-day viral analytics data mine chart was used to sample the tweets for mentions for #NewTwitter. It was determined that a sample that incorporated all tweets would be too large to examine each day. Therefore only tweets found within a peak were gathered. A peak was defined as any instance where the tweet volume changed between the baseline by 1,000 tweets and the next day. For example 13 September had 0 tweets however the next day had more than 120,000 tweets. Thus 14 September is peak #1. Five peaks were observed; 15, 24 and 28 September; 7 and 21 October (see figure 41). The sample discovered an additional peak that occurred on 16 December 2010 after the timeline ceased (see section 5.2.1) this was included in the sample because it fitted the sample criteria.

5.3.2.3 Sample method for selection

Twitter account “maccymacx” (the researcher twitter account) was used to gain entry into Research.ly to gather the required sample.

5.3.2.4 Determining sample size

A sample size calculator was used to determine the number of tweets needed (Creative Research Systems, 2007). The calculator identified that the six peaks contained 427,925 tweets that mention #NewTwitter hashtag. Using a 95% confidence level, often used by researchers, and confidence interval of 4, based on the population size and a 50% percentage, a sample size of 599 was recommended. However this could not be equally divided across six samples resulting in a sample size of 600 i.e. 100 tweets from each peak.

5.3.2.5 Sampling and data collection

Similarly to study one (see chapter 3) GIA was used to organise the data (see chapter 2).

5.3.2.6 Data cleaning

Research.ly 1000-day viral analytics data mine chart was used to identify the six peaks that contained mentions of #NewTwitter (see figure 62). One hundred tweets from each peak were copied to a Word document where miscellaneous characters, images and hyperlinks were removed. Each tweet was compared to Research.ly output where missing characters were identified and added. After the transfer process the raw data files were presented in a common format: .doc files, margin of 2.0 respectively, font Times New Roman and font size 10 (see figure 63).

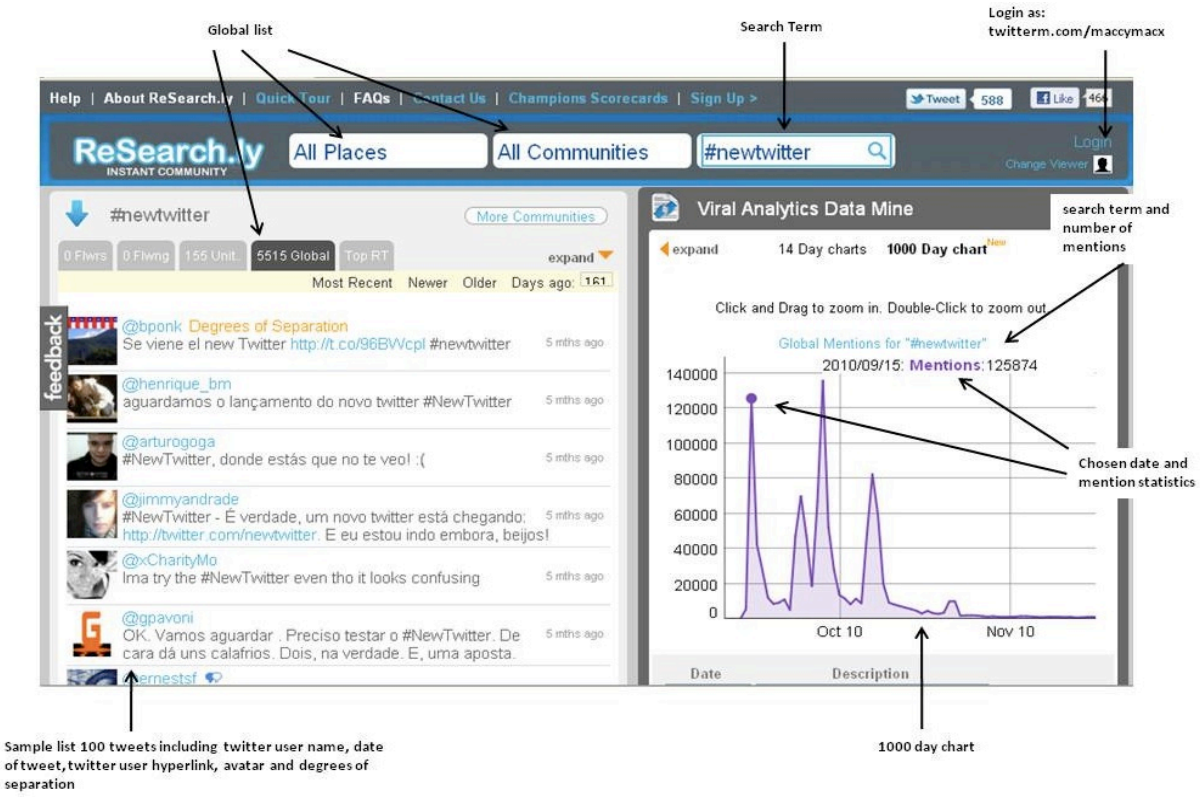


Figure 62. Research.ly user interface.

The .doc files were uploaded into qualitative analysis software (Atlas.ti version 6) where a unique identifier was added to each tweet and hyperlinked Twitter names were expanded (see figure 63). It was identified that almost half of the tweets were written in non-English.

The languages of these tweets were detected and translated to English using Google Translator and memos attached containing translations. These memos also contained descriptions of hyperlinks for example website URL, videos and images (see figure 64).

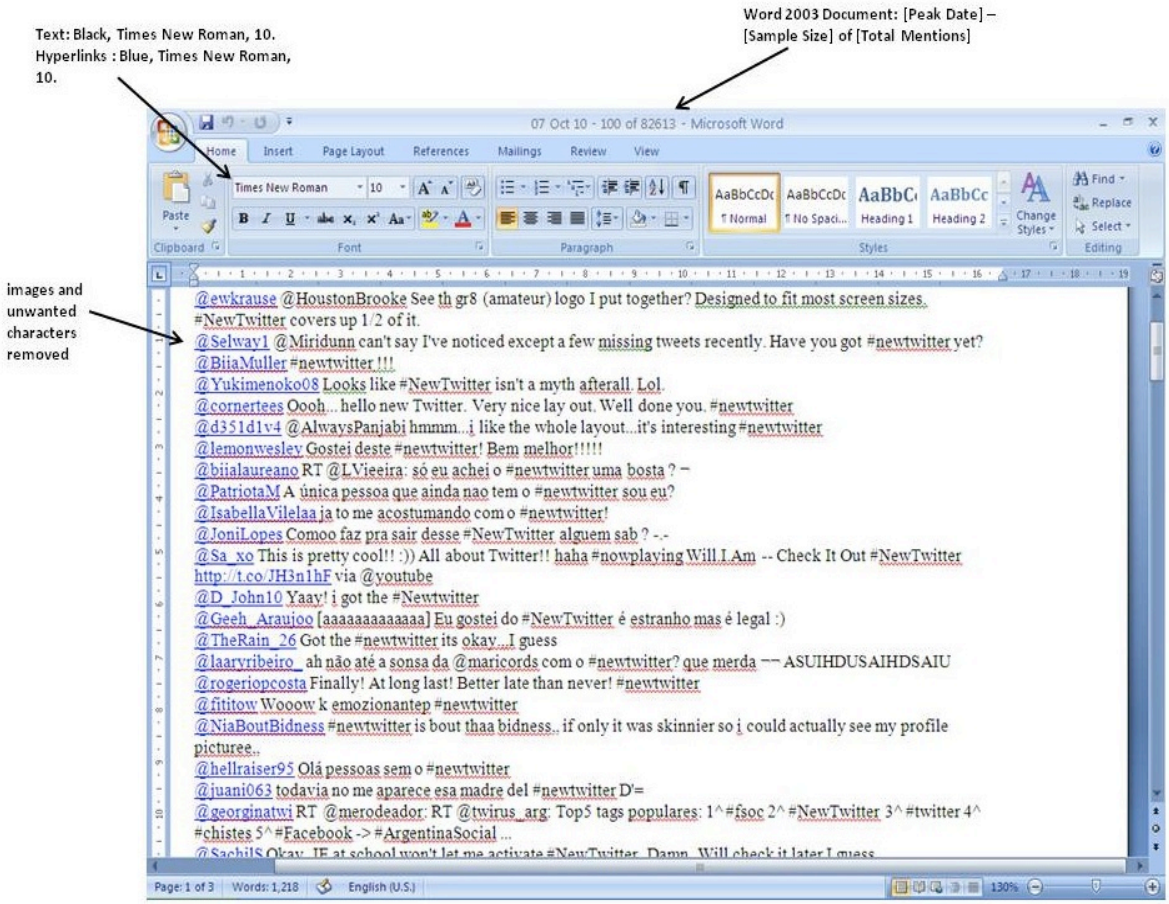


Figure 47. Example of the common format used in all .doc transcription files.

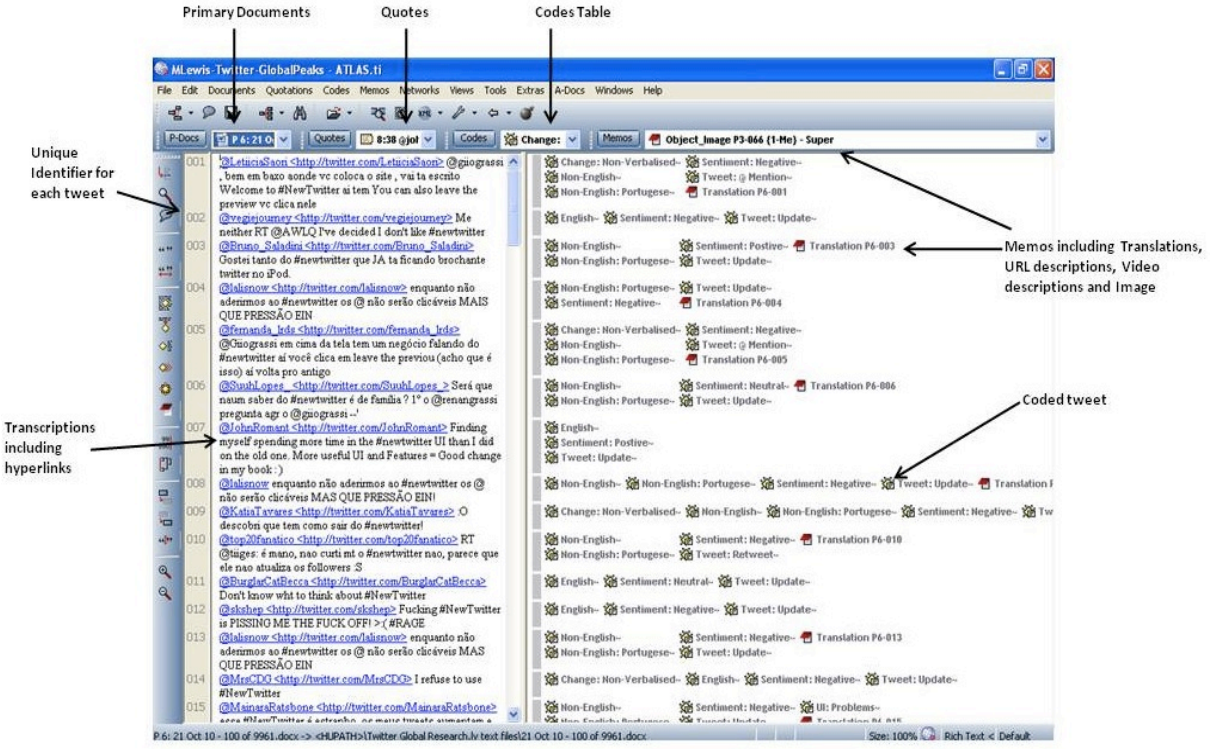


Figure 48. Example primary document in Atlas.ti.

5.3.2.7 Close reading of text

The raw tweets and memos were read repeatedly until familiarisation of the tweets and an understanding of the themes covered was achieved.

5.3.2.8 Creation of categories

The tweets were coded using the GIA. They were coded as tweets i.e. a sentence up to 140 characters. Qualitative analysis software (Atlas.ti version 6.0) was used to code the text units.

The upper-level categories were identified and defined (see table 14) to provide an overview of each tweet for example Sentiment. Similarly to exploratory interview study (see chapter 3) this was followed by lower-level categories for example "Sentiment" Positive, which were added to the category list and re-coded across all text units (see table 14 italics).

No.	Category	Description
1	English	Tweets in English
2	Non-English	Tweets not in English
3	Type	Tweets that denote a tweet type for example @ mention, retweet, update or spam
4	Sentiment	Tweets that denote a particular attitude (positive, negative or neutral) with respect to #newtwitter or the overall tonality of the tweet.
5	Question	Tweets where reference is made to a question asked or answered by a user
6	"Non-English" Dutch	Tweets not in English but in Dutch
7	"Non-English" French	Tweets not in English but in French
8	"Non-English" Swedish	Tweets not in English but in Swedish
9	"Non-English" Galician	Tweets not in English but in Galician
10	"Non-English" German	Tweets not in English but in German
11	"Non-English" Indonesian	Tweets not in English but in Indonesian
12	"Non-English" Italian	Tweets not in English but in Italian
13	"Non-English" Japanese	Tweets not in English but in Japanese
14	"Non-English" Portuguese	Tweets not in English but in Portuguese

No.	Category	Description
15	“Non-English” Romanian	Tweets not in English but in Romanian
16	“Non-English” Russian	Tweets not in English but in Russian
17	“Non-English” Spanish	Tweets not in English but in Spanish
18	“Type” Update	Tweets that denote an update
19	“Type” @mention	Tweets that denote an @mention
20	“Type” Retweet	Tweets that denote an Retweet
21	“Type” Spam	Tweets where no reference is made to #newtwitter but used the hashtag
22	“Sentiment” Positive	Tweets where the overall attitude is positive
23	“Sentiment” Negative	Tweets where the overall attitude is negative
24	“Sentiment” Neutral	Tweets where the overall attitude is neutral
25	“Question” What	Tweets where a question is asked or answered related to what #newtwitter is
26	“Question” When	Tweets where a question is asked or answered related to when #newtwitter is available
27	“Question” How	Tweets where a question is asked or answered related to how to get #newtwitter
28	“Question” Who	Tweets where a question is asked or answered related to who has #newtwitter

Table 14. Upper-level and lower-level categories[15].

[15] Quotation marks reference category originality for example “Sentiment” Negative originates from Sentiment.

5.3.2.9 Overlapping coding and uncoded text

Similarly to the exploratory interview study (see chapter 3) many of tweets were coded into more than one category for example "@1gorgeouschanel <http://twitter.com/1gorgeouschanel> RT @GadelhaCaio: I HAVE #NEWTWITTER. You wanna a Invitation? RT is AUTOMATIC!" was categorised under English, Question: How, Sentiment: Neutral, Type: Retweet.

These overlaps were regularly reviewed as categories were added and removed. However GIA allows overlapping therefore most multi categorised tweets were left in place (Thomas, 2006). Additionally non-coded tweets were as coded Spam.

5.3.2.10 Revision and refinement

Each category and its associated tweets were searched for emerging categories (see Table 15). For example tweets referring to change explicitly were identified for example "@FNJose <http://www.twitter.com/FNJose> #newtwitter???... ahh i don't like #change but lets try it. :)" was coded 'Change: Explicit'.

Whilst others for example "@MaeAberdeen <http://www.twitter.com/MaeAberdeen> I find the #NewTwitter kind of scattered. Can I go back to the usual twitter? I like it more. But I like the photo preview of the new one" were coded 'Change: non-Explicit'.

No.	Category	Description
29	Change	Tweets where reference is made to change i.e. process twitter used, feelings regarding change or intended actions
30	*"Change" Explicit*	*Tweets where reference is explicitly made to change i.e. process twitter used, feelings regarding change or intended actions*
31	*"Change" non-Explicit*	*Tweets where reference is not explicitly made to change i.e. process twitter used, feelings regarding change or intended actions*
32	User Interface	Tweets where reference is made to the user interface or features
33	*"User Interface" Suggestion*	*Tweets where reference is made to the user interface or features more specifically suggestions for improvements*
34	*"User Interface" Problem*	*Tweets where reference is made to the user interface or features more specifically problems*
35	Comparison	Tweets where reference is made to other API's, systems, websites or change events

Table 15. Upper-level emerging categories and lower-level emerging categories (shown in italics).

5.3.2.11 Category model

GIA states that the findings should capture only the key themes that match the study questions using eight or fewer categories (Thomas, 2006). However creating a model that follows this would not fully answer the study questions (see section 5.2.2). Thus a network diagram that expressed the 35 categories whilst considering their relationships and importance was developed (see figure 65).

The network identified eleven key categories to report the findings: "Sentiment" Positive, "Sentiment" Negative, "Question" How, "Question" What, "Question" When, "Question" When, "Question" Who, Change, "User Interface" Suggestion, "User Interface" Problem, "Type" Retweet and Comparison.

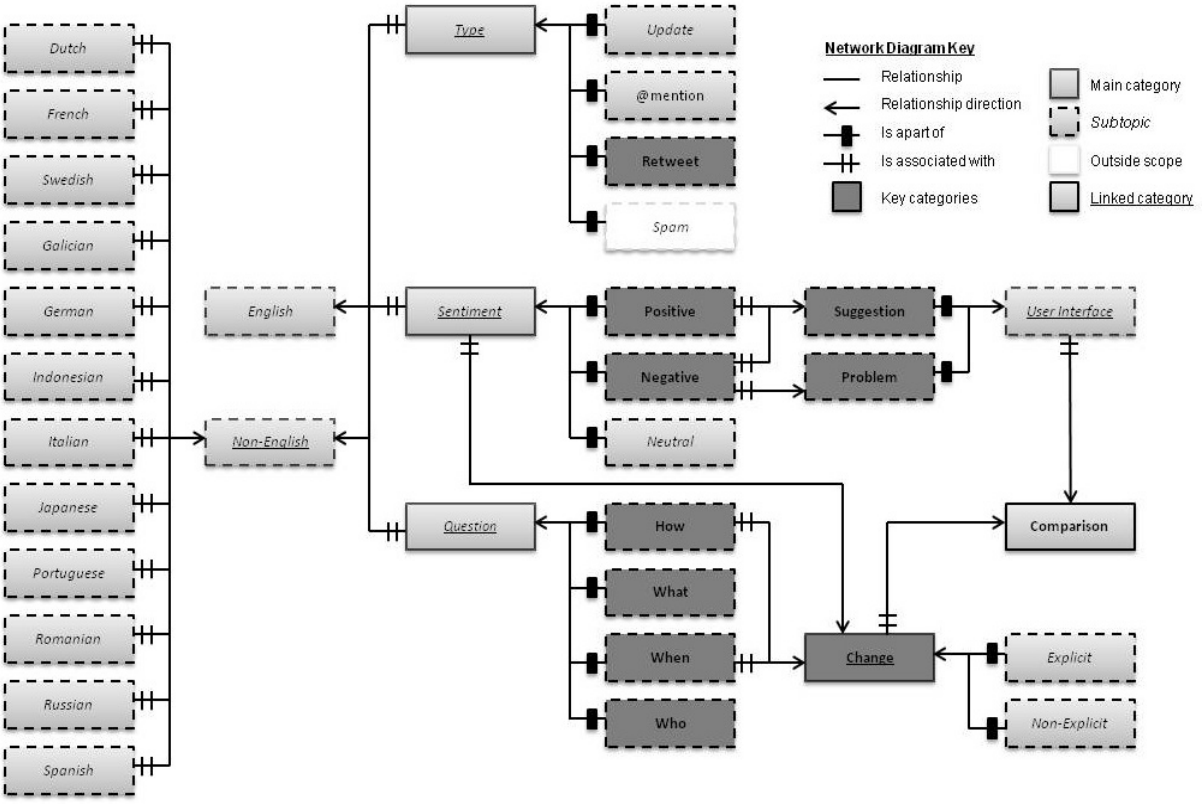


Figure 49. Network diagram.

5.3.3 Findings

The category primary documents table (see table 16) alongside network diagram (see figure 65) and tweets were used to report the study findings.

The upper-level categories: basic demographics i.e. tweet type, sentiment, subject i.e. question, were main headings. The refined upper-level and lower-level categories: comparison and suggestions were sub-headings and the sub-topic acceptance i.e. change was discussed throughout (see appendix b section b.3.1 for sample data).

	PRIMARY DOCUMENTS						
Codes	15/Sept/10	24/Sept/10	28/Sept/10	07/Oct/10	21/Oct/10	16/Dec/10	Total
Language:							
English	66	57	59	46	47	70	345
Non-English	34	42	41	51	52	31	251
Dutch	0	0	0	1	0	0	1
French	0	1	0	0	1	0	2
Galicia	1	1	3	1	5	0	11
German	1	0	0	0	0	0	1
Indonesian	0	0	0	1	0	0	1
Italian	1	0	0	0	0	3	4
Japanese	3	0	0	0	1	0	4
Portuguese	15	37	25	44	35	21	177
Romania	0	0	1	0	0	0	1
Russian	0	0	0	0	2	0	2
Spanish	12	4	12	6	9	6	49
Swedish	1	0	0	0	0	0	1
Tweet Type:							
@ Mention	7	8	12	11	11	12	61
Retweet	28	41	27	8	12	18	134
Update	67	52	61	81	78	73	412
Spam	1	0	0	3	3	1	8
Sentiment:							
Positive	54	37	36	45	25	13	210
Negative	32	50	54	40	61	75	312
Neutral	14	13	10	12	11	11	71
Context:							
Change: Non-Explicit	1	3	2	8	13	24	51
Change: Explicit	2	1	1	1	0	3	8
Question: How	2	11	1	6	1	0	21

Question: What	15	5	4	4	2	0	30
Question: When	26	9	3	3	0	0	41
Question: Who	1	20	22	7	1	1	52
UI: Problems	2	0	2	8	26	18	56
UI: Suggestions	3	1	0	0	1	0	5
Comparison	3	0	7	2	2	6	20
Totals	**393**	**383**	**389**	**399**	**386**	**392**	2342

Table 16. Category Primary Documents.

5.3.3.1 Summary

Using Research.ly 1000-day viral analytics data mine chart for #NewTwitter six peaks were identified (see figure 66). The chart shows that the majority of activity occurred during the first three weeks of #NewTwitter. The timeline (see section 5.2.1) found that Twitter focused on advertising, roll out (deployment) and communication with the media and users.

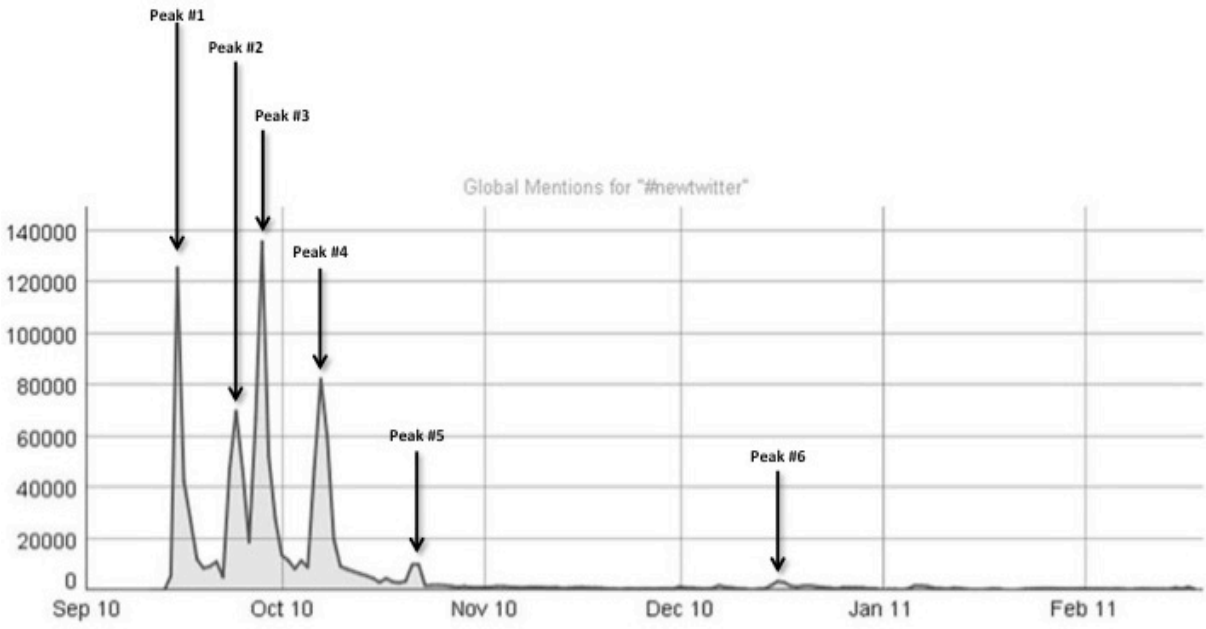


Figure 50. Mentions for #NewTwitter created by Research.ly.

5.3.3.1.1 Basic demographics

The sample of 427,925 tweets showed that 67% were @mentions, 22% re-tweets, 10% updates and 1% spam; the majority (58%) were written in English whilst 42% were written in other languages (see figure 67).

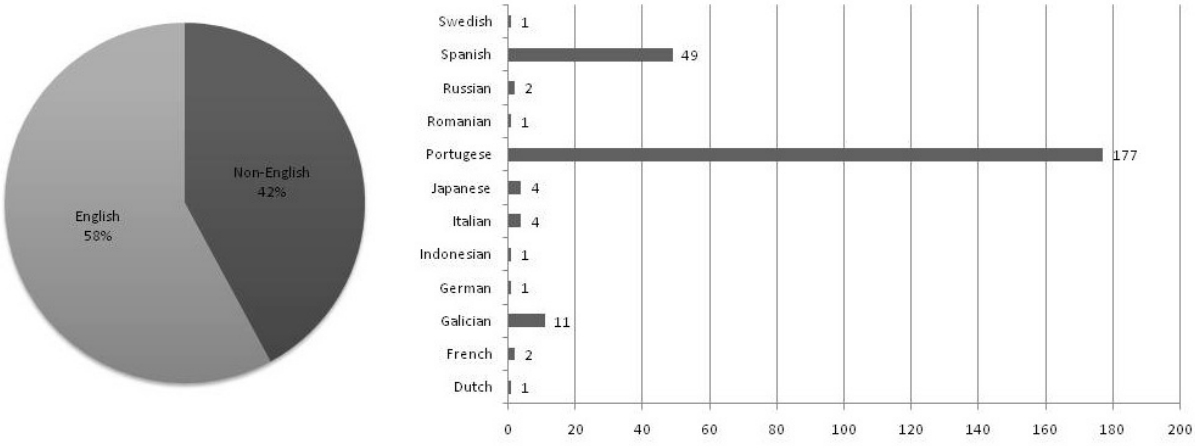


Figure 51. Languages used: 58% were written in English and 42% non-English (majority were Portuguese).

5.3.3.1.2 Sentiment

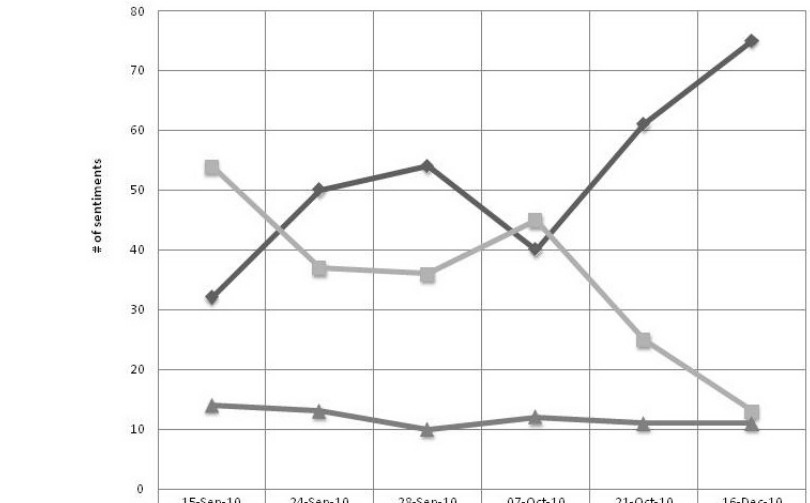
Tweets sentiments were largely positive during the first and second peak (54%) (see figure 67). This was attributed to initial #NewTwitter excitement however this gradually decreased to 13% (peak #6) as roll out continued.

From peak #2 negative sentiments became predominant, 50% increasing to 75% by the sixth peak, with the majority of users tweets concerning a dislike of #NewTwitter and asking 'how' (or reverting to #OldTwitter).

However a difference later appeared (see peak #4) with 45% positive sentiments compared to 40% negative sentiments. This was attributed to an increased roll out and Twitter endorsing a #NewTwitter descriptive video by popular singer for example @IamWill and @NickiMinaj.

Nevertheless after the event negative sentiments became predominant again. During this time neutral sentiments remained steady between 10% and 14%. One twitter user described:

Example 1: "@sophiaife <http://twitter.com/sophiaife: #newtwitter".



	15-Sep-10	24-Sep-10	28-Sep-10	07-Oct-10	21-Oct-10	16-Dec-10
Negative Sentiment	32	50	54	40	61	75
Postive Sentiment	54	37	36	45	25	13
Neutral Sentiment	14	13	10	12	11	11

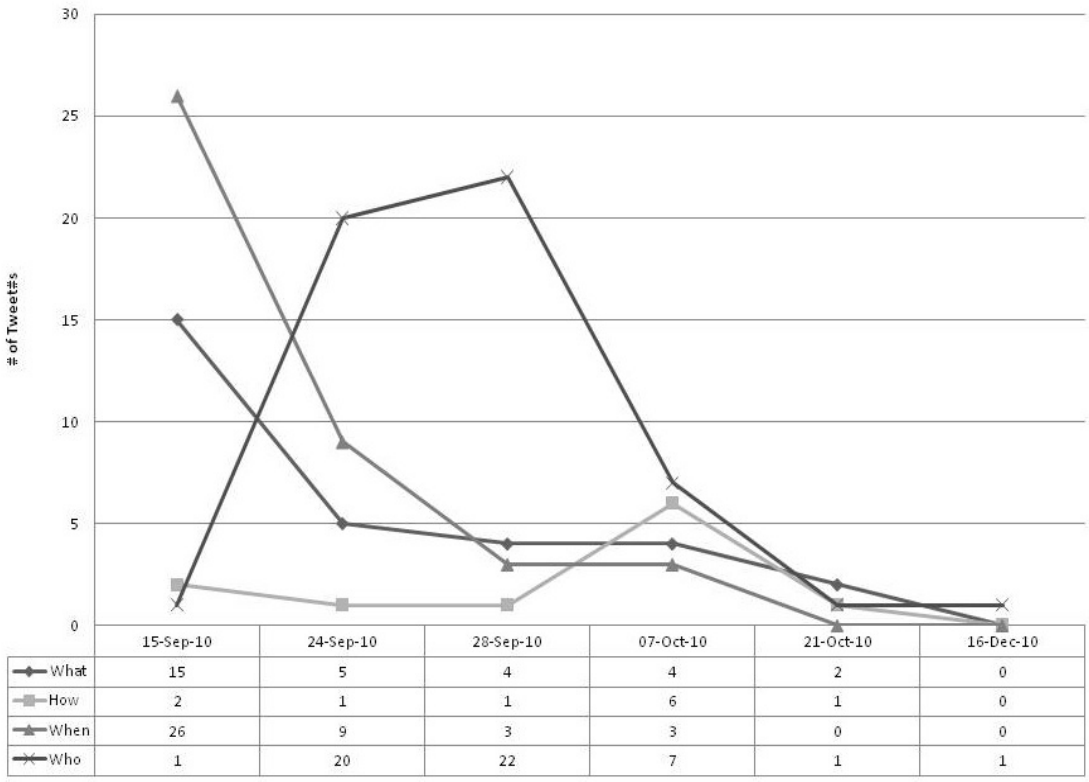
Figure 52. Sentiments: positive, negative and neutral.

5.3.3.1.3 Subject

The content of the tweets varied as roll out progressed (see figure 69). During peak #1 59% of users were concerned with 'when' #NewTwitter would arrive. Whilst 34% of users were asking or describing 'what' it was.

By the second peak users were asking 'who' had or did not have access to #NewTwitter (57%) whereas 'when' and 'what' were of decreasing concern (26% and 15%). This increased interest in 'who' continued throughout peak #3 (63%) but decreased in peak #4 (35%) due to users who did not have access to #NewTwitter were asking 'how' (30%) they could get it or began providing false methods about 'how' others could get it.

Peaks #5 and #6 are not significantly relevant because roll out had completed.



	15-Sep-10	24-Sep-10	28-Sep-10	07-Oct-10	21-Oct-10	16-Dec-10
What	15	5	4	4	2	0
How	2	1	1	6	1	0
When	26	9	3	3	0	0
Who	1	20	22	7	1	1

Figure 53. Tweet questions: what, how, when and who.

5.3.3.1.4 Change acceptance

The word 'change' was used to assess users acceptance of #NewTwitter. Atlas.ti quantitative analysis tool was used to extract explicit words: change, changed and changing (see table 17) and were coded as Change: Explicit (see figure 70).

The data indicate that at the beginning of the roll out peak #1 and #2, users expressed an overall concern regarding the impending change. One Twitter user described:

> **Example 2:** "@FNJosue <http://twitter.com/FNJosue> #newtwitter???... ahh I don't like #change but lets try it :))"

Furthermore users also compared #NewTwitter to other negative change experiences predominately Facebook. One Twitter user described:

Example 3: "@JonoHawk <http://twitter.com/JohoHawk> #NewTwitter reminds me of when #Facebook changed everything and I quit that a long time ago"

Word	Peak 1	Peak 2	Peak 3	Peak 4	Peak 5	Peak 6
Change	0	1	0	0	1	1
Changed	0	0	1	0	0	1
Changing	0	0	0	0	0	4

Table 17. Quantitative analysis of explicit use of the words: change, changing and changed.

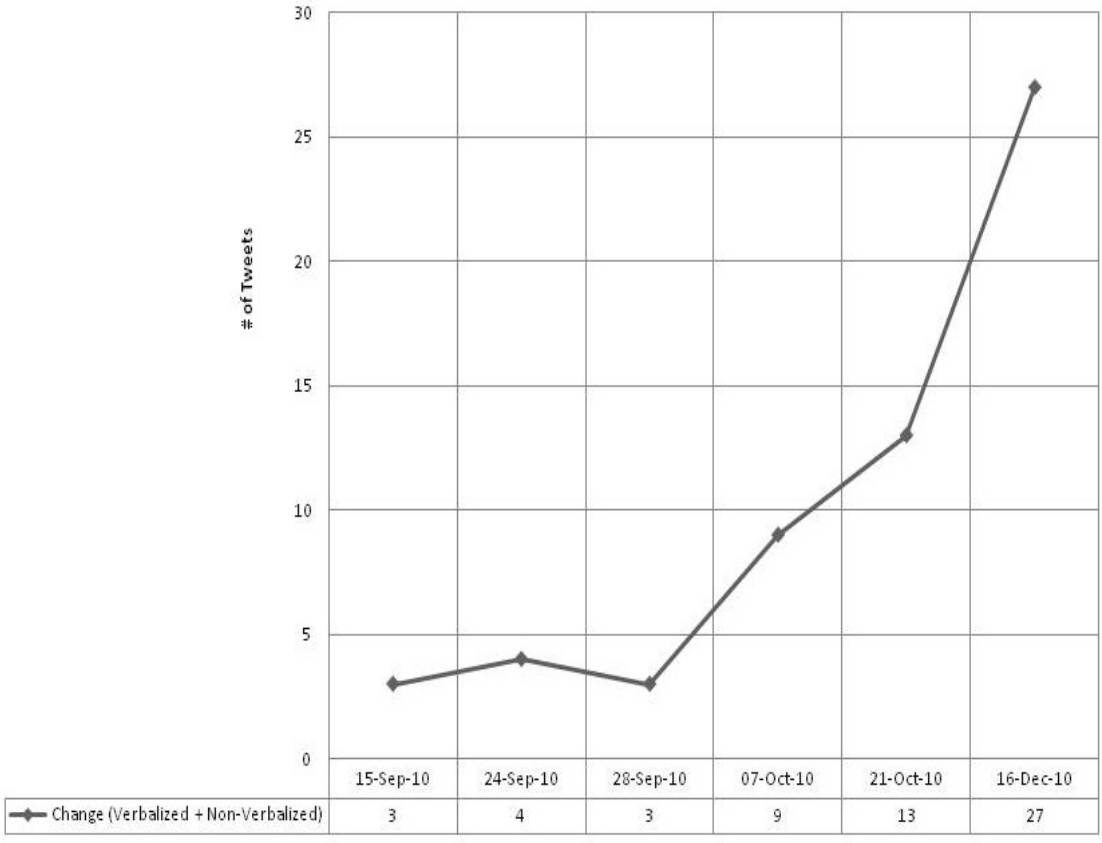


Figure 54. Explicit and non-explicit change across global peaks.All messages related to change were multi-coded as negative sentiments, the increase of change is directly related to the increase in negative sentiments.

However during #NewTwitter roll out, from 14 September to 11 October 2010, users did not explicitly use change words instead they began to express their acceptance non-explicitly.

Initially users were excited when receiving #NewTwitter posting tweets with positive sentiments. However these were short lived as most users were not able to commit to #NewTwitter. One Twitter user described:

> **Example 4:** "@FabioPortoM <http://twitter.com/FabioPortoM> nao achei o #newtwitter tao ruim... mas eu voltei pro antigo - I found the #newtwitter not so bad... but I went back to the old one".

Though some users offered specific reasons for non-acceptance. Two Twitter users described:

> **Example 5:** "@VyvyanN <http://twitter.com/VyvyanN> well. Apparently #newtwitter doesn't work properly on my work browser. back to old twitter it is"
> **Example 6:** "@mrc_amanda <http://twitter.com/mrc_amanda> voltei pro velho, o #newtwitter e horrivel - return to old #newtwitter is horrible"

The study found that other users were stubborn and refused to try #NewTwitter. One Twitter user described:

> **Example 7:** "@MrsCDG <http://twitter.com/@MrsCDG> I refuse to use #newtwitter"

Whilst other users accepted that #NewTwitter was the future and that they needed to get used to it. Two Twitter users described:

> **Example 8:** "@sammieeallen <http://twitter.com/sammieeallen> i hate #newtwitter but I'm using it to get used to it, since the old twitter won't be around much longer >:("
> **Example 9:** "@_Pkaique <http://twitter.com/_Pkaique> FINALMENTE consigo usar #newtwitter *-* ... Mas acho que prefiro o antigo... :S preciso acostumar com esse - FINALLY I can use #newtwitter *-* ... But I think I prefer the old... :S. I need to get used to this"

Unexpectedly many users did not understand the term ‘preview’ used by Twitter causing them to regret trying #NewTwitter because they thought they could not return to #OldTwitter. Two Twitter users described:

> **Example 10:** “@NBoogey_x3 <http://NBoogey_x3 <http://twitter.com/NBoogey_x3> I regret switching to this #newtwitter gah”
>
> **Example 11:** “@TimothyJLynch <http://twitter.com/TimothyJLynch> Dude #newtwitter sucks... Can I opt out?”

However this confusion was short lived as other users found solutions and offered instructions. These instructions likely resulted in more confusion causing more users to reject #NewTwitter. One Twitter user described:

> **Example 12:** “@fernanda_lrds <http://twitter.com/fernanda_lrds> @Giiograssi em cima da tela tem um negocio falando do #newtwitter ai voce clica em leave the previou (acho que e isso) ai volta pro antigo - on top of the screen has a business talking about the #newtwitter you click there leave the preview (I think it is) then back to old”.

After the roll out specifically during peak #6 Twitter changed their #NewTwitter welcoming message (see figure 71). This caused users to tweet concerns about the impending #NewTwitter refreeze (Lewin, 1952). Two Twitter users described:

> **Example 13:** “@kaajalsomal <http://twitter.com/kaajalsomal> RT @Jbloverz4lyfe: Everyone’s twitter is changing the #newtwitter one by one so... DON’T PANIC... wait. PANIC”
>
> **Example 14:** “Ne55iepooh <http://twitter.com/Ne55iepooh> This is truly haunting me... “You’re using an older version of Twitter that won’t be around for much longer”... Noooooo I HATED #NewTwitter!!”.

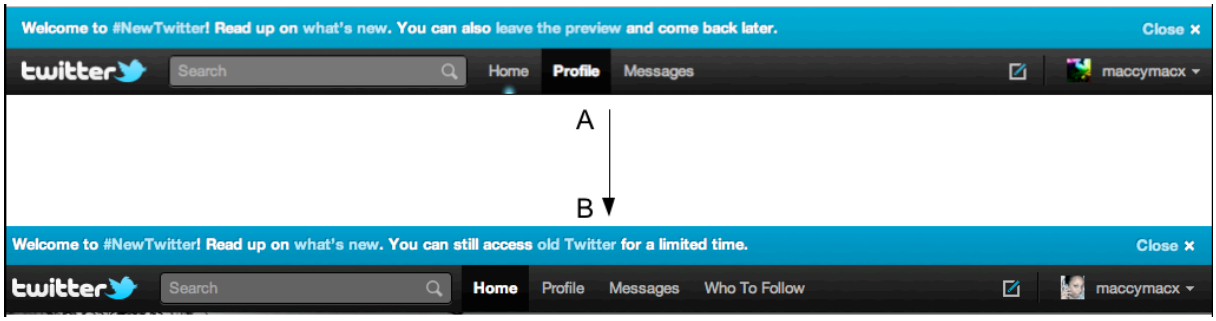


Figure 55. Twitter change process welcoming message: (a) original (b) changed.

Furthermore as peak #6 continued users started to excessively question the need for #NewTwitter or stated they wanted choice between the two user interfaces. Two Twitter users described:

> **Example 15:** "@_iam_Sam <http://twitter.com/_iam_Sam> Why are they forcing the #newtwitter on us"
>
> **Example 16:** "@ar_hoi <http://twitter.com/ar_hoi> RT @WFv2: Old Twitter will soon be gone. Please RT if you prefer #oldtwitter to #newtwitter and think it should be available as an option"

Furthermore a minority of users said their use of Twitter would decrease if they were forced to use it. One Twitter user described:

> **Example 17:** #NewTwitter "@Paulas_TayTay <http://twitter.com/Paulas_TayTay> When I'm forced to use the #newtwitter, you will hardly ever see me on it."

5.3.3.2 Six peaks

This section discusses each peak for #NewTwitter mentions in more detail.

5.3.3.2.1 Global peak #1

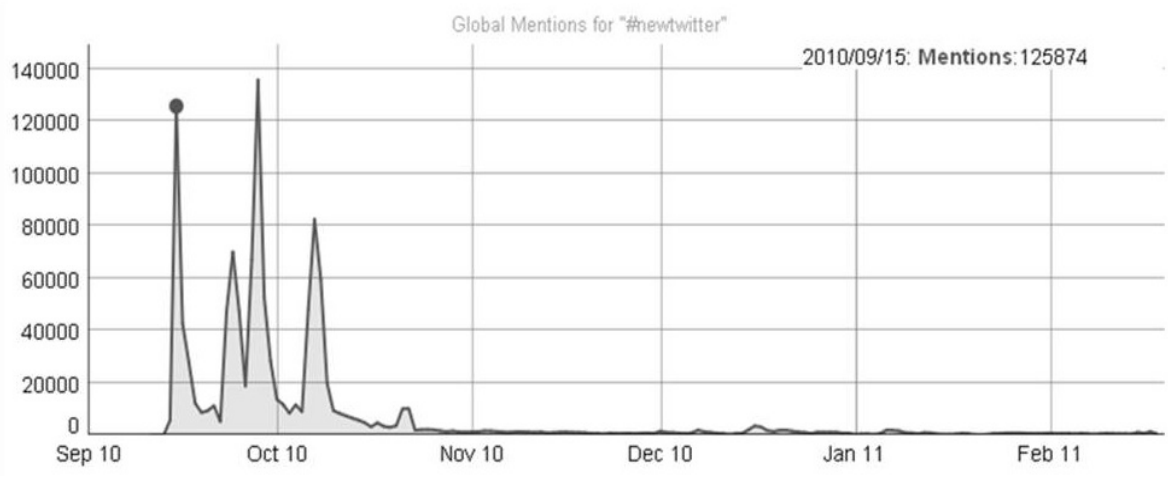


Figure 56. Global peak #1 15 September 2010 created by Research.ly.

Research.ly identified 125,874 tweets were sent during peak #1 (see figure 72).

During this peak Twitter announced via their blog, YouTube page and invitations were sent to media about a HQ #NewTwitter launch.

Additionally Twitter announced support for #NewTwitter alongside a descriptive video of the new user interface from their official Twitter accounts. Twitter users reacted positively to Twitter activities (54%), they were excited that #NewTwitter was coming. One Twitter user described:

> **Example 18:** "@Littyane <twitter.com/Littyane> #NewTwitter?! Anxious to see what's new"

This caused Twitter's official launch announcement to become a popular Retweet. During the peak users began to ask when #NewTwitter was available by way of public messages and @mentions to the Twitter official page and their associated staff pages. Two Twitter users described:

> **Example 19:** "@teachforever09 <twitter.com/teachforever09> The new Twitter looks really interesting – I am wondering when I'll see some of the new features. #newtwitter"
>
> **Example 20:** "@dmccallie <twitter.com/dmcallie> RT @DoneMacAskill: . @ev Billions of @SmugMug photos and videos would love to play nice with #newtwitter. Pretty please?"

Additionally the few users who had #NewTwitter tweeted comparisons with other recently changed websites for example Orkut and Flipboard. These users were also providing screenshots of the #NewTwitter user interface to their followers. One Twitter user described:

> **Example 21:** "@btaylorSEO <twitter.com/btaylorSEO> RT @JoannaLord here is a shot of the new Search Box built into the platform. @Starbucks I used you [illegible] #newtwitter http:///twitpic.com/2ohnd6"

Furthermore these users were also identifying issues with #NewTwitter especially missing features. One Twitter user described:

> **Example 22:** "@heliopaz <http://twitter.com/helopaz> RT @joaosergio: uma funcionalidade que o #newtwitter deveria ter: filtro – a feature that should have #newtwitter: filter"

FInally those who did not have it were apprehensive and disliked the roll out process Twitter was using. Whilst others were asking how to get it or were trying various methods for example logging in and out repetitively. One Twitter user described:

> **Example 23:** "@fwopath http://twitter.com/fwopath was totally expecting @twitter to rollout the #newtwitter today. Oh well"

5.3.3.2.2 Global peak #2

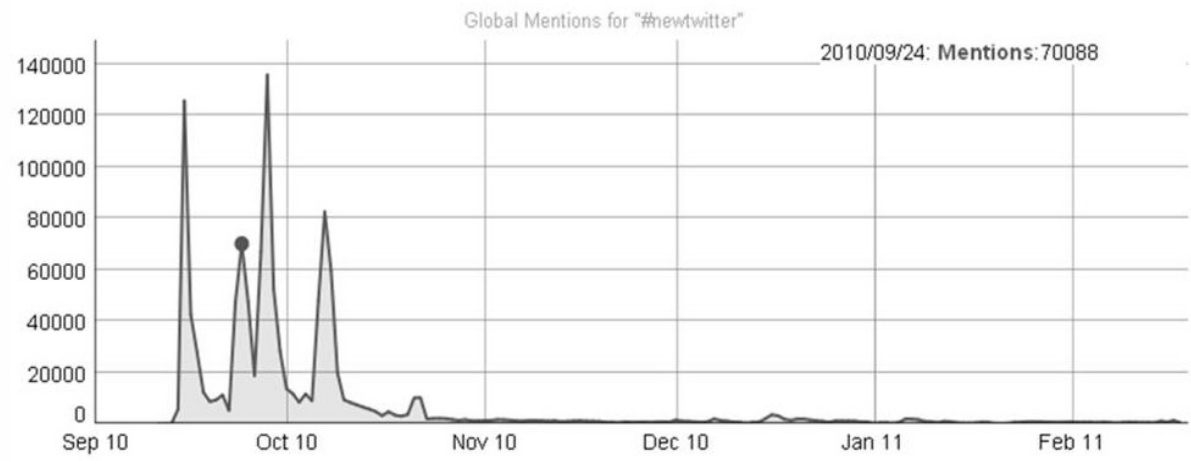


Figure 57. Global peak #2 24 September 2010 created by Research.ly.

Research.ly identified 70,088 tweets during peak #2 (see figure 73).

Prior to this peak Twitter advertised #NewTwitter on their engineering blog, YouTube and on their Help Centre homepage. Additionally Twitter staff began posting #NewTwitter pro-tips on their respective Twitter profiles.

During the peak Twitter began making active #NewTwitter to UK users and US users causing the hashtag to become a trending topic within those locations. Twitter users reacted more negatively to Twitter activities (50%), those who did not have it became increasingly impatient causing a popular Retweet by @PrettyBoyPorter "RETWEET if you don't have the #NewTwitter." This led to some users believing #NewTwitter was a hoax (not real). One Twitter user described:

> **Example 24:** "@Soben <http://twitter.com/Soben> Agreed. I haven't seen it yet. At. All. RT @NewMonarch: I feel like #newtwitter might be a hoax the rest of the Internet is pulling on me"

Tweets such as these were frequent and reinforced users dislike of the roll out approach Twitter were using. During this time some users who had it were mostly indifferent. Whilst they liked the new user

interface they were unable to commit to it. However 37% of tweets were positive and these came from users who had it. Three Twitter users described:

> **Example 25:** "@marcosv_a <http://twitter.com/marcosv_a> ainda nao me acostumei mt com ese #NewTwitter – have not got used to this #newtwitter" or preferred #OldTwitter "@mmappgg <http://twitter.com/mmappgg> I much prefer the old twitter than the #NewTwitter"
>
> **Example 26:** "@FabioPortoM <http://twitter.com/FabioPortoM> nao achei o #newtwitter tao ruim.. mas eu voltei pro antigo. x – I found the #newtwitter not so bad… but I went back to the old one. x"
>
> **Example 27:** "@DenninPacheco <http://twitter.com Caralho o #newtwitter ficou muito bonito! Parabens aos desenvolvedores - F*** the #newtwitter was very cute! Congratulations to the developers"

Other tweets were from users who had #NewTwitter and were offering false instructions about how others could get it. These tweets became highly popular especially amongst Retweets making them appear positive (believable) to users.

5.3.3.2.3 Global peak #3

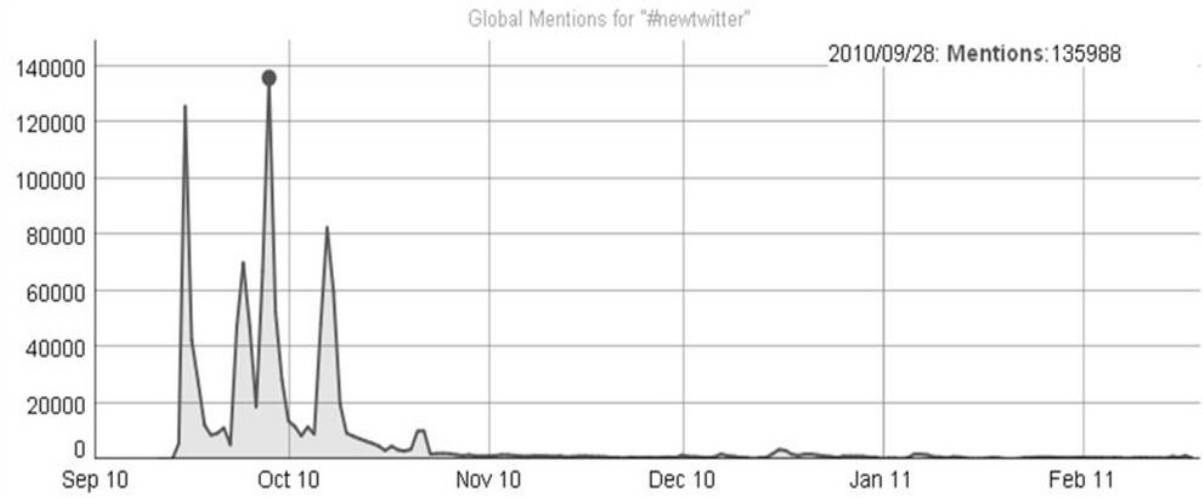


Figure 58. Global peak #3 28 September 2010 created by Research.ly

Research.ly identified 135,988 tweets during peak #3 (see figure 49).

Prior to this peak Twitter was quiet, no major announcements or media interest were evident. During the peak #NewTwitter hashtag became localised trending topics to other countries and cities within UK and US. This was attributed to Twitter staff tweeting from their accounts that #NewTwitter was still distributing.

Twitter was also promoting a Golden Ratio[16] sketch on their official Flickr profile.

However Twitter users reacted more negatively to Twitter activities (54%). Most users were asking when they would get it. Whilst others were declaring their frustrations about not having it. Two Twitter users described:

[16] The Golden Ratio is an irrational mathematical constant found in everything from art to architecture (Ehrlich, 2010). In this instance Twitter's creative director produced a Golden Ratio for #NewTwitter http://www.flickr.com/photos/twitteroffice/5034817688/ with the following caption "To anyone curious about #NewTwitter proportions, know that we didn't leave those ratios to chance. This, of course, only applies to the narrowest version of the UI [user interface]. If your browser window is wider, your details pane will expand to provide greater utility, throwing off these proportions. But the narrowest width shows where we started, ratio-wise" (Ehrlich, 2010).

Example 23: "@BelieberHelper <http://twitter.com/ BelieberHelper> RT @AVERofficial: @Iwannaknowhy I still don't have the #newtwitter … hmmmm,,, am I the only one?"

Example 23: "@Mr_Seal_UrGirl <http://twitter.com/Mr_Seal_UrGirl> If I don't have the #newtwitter within the next week or so… I'm going to write anonymous hate letters to management lol".

This led to a popular Retweet by @TweetyQuote "RETWEET if you don't have the #NewTwitter". However users that had it were negatively comparing it to change experiences on other OSNs specifically Facebook. One Twitter user described:

Example 23: "@JohoHawk <http://twitter.com/JohoHawk> #NewTwitter reminds me of when #Facebook changed everything and I quit that a long time ago".

The study found that some users struggled with radical restructuring, nevertheless 36% of tweets were positive coming from users who had it, they liked #NewTwitter. One Twitter user described:

Example 23: "@dsc0pes <http://twitter.com/dsc0pes> hmm, I might actually tweet from the computer for this #NewTwitter".

5.3.3.2.4 Global peak #4

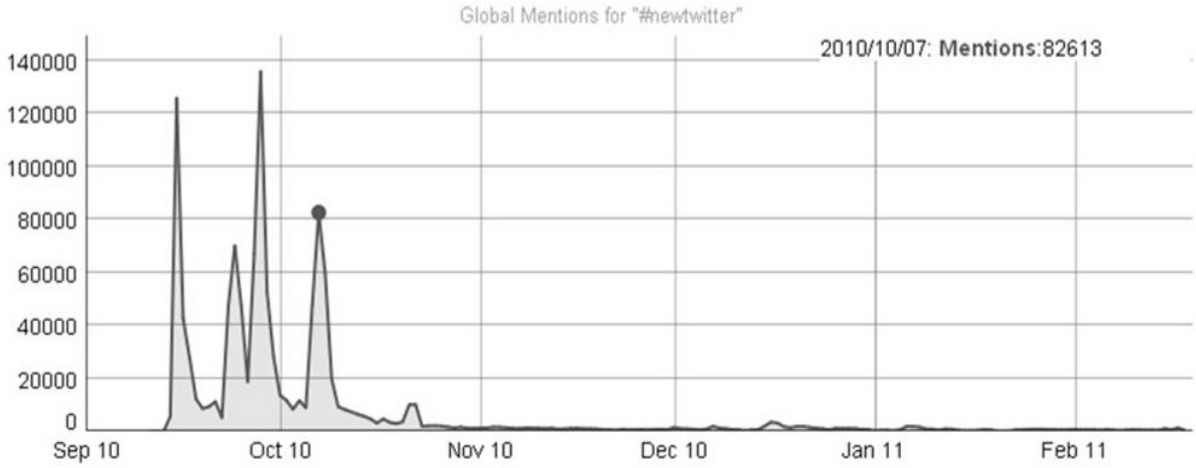


Figure 59. Global peak #4 7 October 2010 created by Research.ly.

Research.ly identified 82,613 tweets were sent during peak #4 (see figure 75).

Prior to this peak media outlets began to release popular interactive videos of #NewTwitter some of which were endorsed by Twitter. Conversely Twitter announced that then CEO had left the OSN that distracted users from the change.

During the peak Twitter endorsed a #NewTwitter descriptive video by popular US singers @IamWill and @NickiMinaj. Twitter users reacted positively to Twitter activities (45%). The #NewTwitter descriptive video by @IamWill and @NickiMinaj became a very positive popular retweet. One Twitter user described:

> **Example 24:** "<@sa_xo <http:twitter.com/so_xo> This is pretty cool!! [illegible] All about twitter!! Haha #nowplaying Will.I.am – check it out #NewTwitter <http://t.co/JH3n1Hf> via @youtube".

Additionally most users were positive about the Twitter change process used because it appeared Twitter had increased its roll out. These activities increased sentiment positivity towards the new user interface. Two Twitter users described:

> **Example 25:** "@Yukimenoko08 <http://twitter.com/Yukimenoko08> Looks like #NewTwitter isn't a myth after all lol".
> **Example 26:** "@EarthlingJac <http://twitter.com/EarthlingJac> #NewTwitter is much. Makes much more sense now".

However 40% of tweets were negative, these came from users who wanted #NewTwitter and those who had it but were experiencing problems. Three Twitter users described:

> **Example 27:** "@bdedgaf <http://twitter.com/bdedgaf> I don't have the #newtwitter @twitter =[".

Example 28: "@gregglhartley <http://twitter.com/gregglhartley> #newtwitter location finder now puts me in wrong community #fail refresh button? Help?".

Example 29: "@Kfinest_ <http://twitter.com/Kfinest_> ever since the #newtwitter I'm barley tweeting!".

5.3.3.2.5 Global peak #5

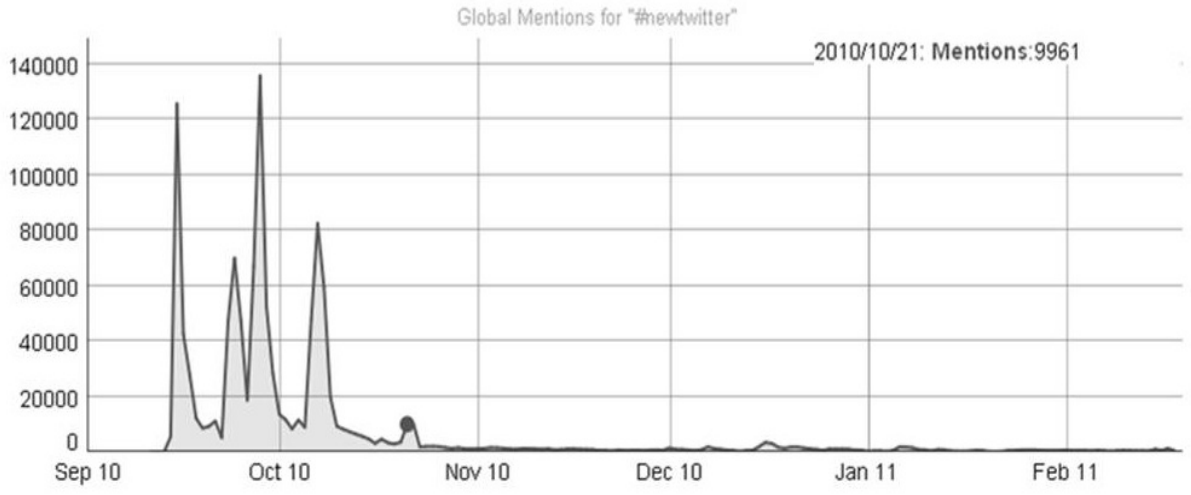


Figure 60. Global peak #5 21 October 2010 created by Research.ly.

Research.ly identified 9,961 tweets were sent during peak #5 (see figure 76).

Prior to this peak Twitter had completed roll out to all Twitter users. During peak Twitter was quiet; no announcements or media interest was evident.

Twitter users reacted more negatively (61%) because #NewTwitter was having problems. Users were reporting missing tweets, incomplete followers lists, inactive preview options, poor browser integration causing slow interaction and dead hyperlinks etc. These excessive problems caused users who had accepted #NewTwitter to consider or revert back to #OldTwitter. Whilst other users had read about these problems and chose not to try #NewTwitter. Two Twitter users described:

Example 30: @Sthefynice <http://twitter.com/Sthefynice> Sincermente… Que pop con este #NewTwitter ._. Ya estoy cuestionanda seriamente si cambiarlo a la version antigue.

#HeDicho – Honestly… that this #NewTwiter popp._. I'm seriously questioning whether to switch to the old version".

Example 31: "@MrsCDG <http://twitter.com/MrsCDG> I refuse to use #NewTwitter".

Additionally developers were commenting on source files to ascertain why the problems were occurring. One Twitter user described:

Example 32: "@karlbright <http://twitter.com/karlbright> Wow, just noticed how bad the markup for #newtwitter is. Cmon @twitter, you're using HTML5 but its still all over the place 😾".

However 25% of tweets were positive, these came from users who were not experiencing problems and had accepted #NewTwitter. One Twitter user described:

Example 33: "@JohnRomant <http://twitter.com/JohnRomant> Finding myself spending more time in the #newtwitter. UI than I did on the old. More useful UI and Features = Good change in my book".

5.3.3.2.6 Global peak #6

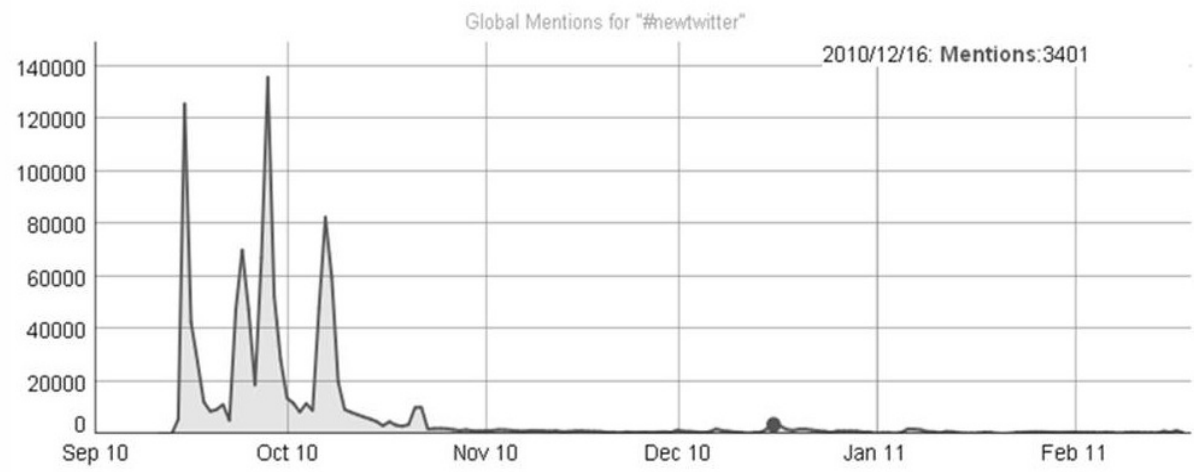


Figure 61. Global peak #6 16 December 2010 created by Research.ly.

Research.ly identified 3401 tweets were sent during peak #6 (see figure 77).

Prior to this peak Twitter was quiet, no major announcements or media interest were evident. During the peak Twitter changed their #NewTwitter welcome message (see figure 71). Twitter users reacted negatively to this (75% negative sentiments). Users disliked the implied impending change causing popular retweets by @Jbloverz4lyfe “Everyone’s twitter is changing the #newtwitter one by one so... DONT PANIC... wait. PANIC” and @Ne55iepooh “This is truly haunting me... “You’re using an older version of Twitter that won’t be around for much longer”... Noooooo I HATED #NewTwitter!!”.

Twitter users were also excessively questioning the need for #NewTwitter and the ‘forced’ approach Twitter was using. One Twitter user described:

> **Example 34:** “@_iam_Sam <http://twitter.com/_iam_Sam> Why are they forcing the #newtwitter on us”.

Additionally users indicated that they wanted a choice, asking for #OldTwitter and #NewTwitter to be available indefinitely. One Twitter user described:

> **Example 35:** “@ar_hoi <http://twitter.com/ar_hoi> RT @WFv2: Old Twitter will soon be gone. Please RT if you prefer #oldtwitter to #newtwitter and think it should be available as an option”.

Additionally users were also posting public messages and @mentions to Twitter’s official profile and their associated staff profiles stating that the force change would reduce their Twitter use.

Furthermore users were also tweeting their dislike of #NewTwitter. Two Twitter users described:

> **Example 36:** “@Paulas_TayTay <http://twitter.com/Paulas_TayTay> When I’m forced to use the #newtwitter, you will hardly ever see me on it...”.
>
> **Example 37:** “@SexyCraigFerg <http://twitter.com/ SexyCraigFerg> #NewTwitter = Unnecessarily wiiiide”.

5.3.4 Study category validation

Assessing the trustworthiness of the data collected and category model was deemed necessary. To do this Research.ly data collection method was verified and a category consistency check was carried out.

5.4.4.1 Data collection method

The initial approach to gather the tweets that mentioned #NewTwitter used TwapperKeeper.com. This allowed researchers to archive Twitter hashtags and or keywords for historical or analytical purposes. The software collected tweets alongside usernames, IP addresses and date and time stamps. The tweets were presented in a .txt file with limited spacing that were intermingled with miscellaneous characters (see figure 78).

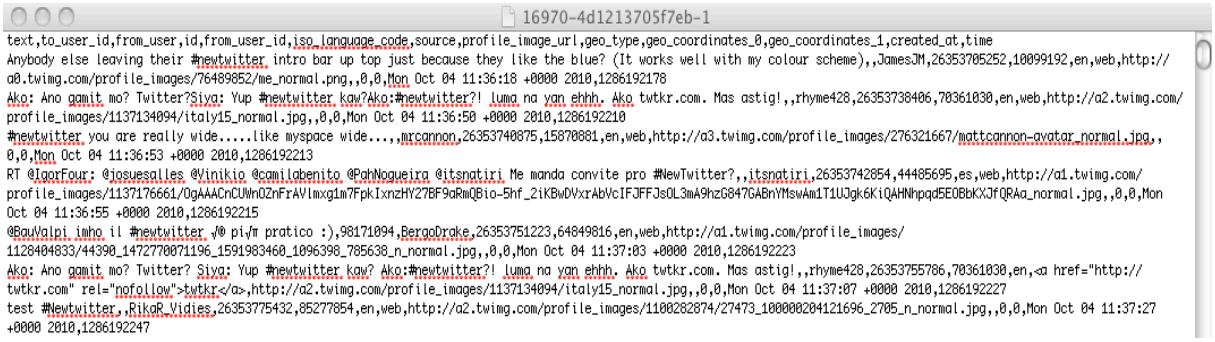


Figure 62. Sample TwapperKeeper.com output.

The poor presentation of the tweets made analysis difficult thus Research.ly was used. However the data collected via TwapperKeeper.com was used as a comparison. Peak #1 tweets were compared with the first hundred tweets from TwapperKeeper.com. The comparison was consistent verifying the Research.ly data collection method.

5.4.4.2 Categorisation

Using the GIA as a reference a category consistency check was used to test the trustworthiness of the category model (Thomas, 2006). This meant having another coder look the category descriptions and code the tweets that belong to each category. This was then compared to the category allocations within the study.

5.4..2.1 Recruitment

The sessions used closed recruitment; only adults with experience of categorising text data were approached. Researchers and PhD students from City University London centre for human-computer interaction design were recruited (see table 18).

ID	Participant categorising data before?	Job title
V01	Yes	PhD student
V02	Yes	Researcher
V03	Yes	PhD student

Table 18. Factual participant data.

5.4..2.2 Instructions

The following instructions were given to participant:

1. Read through the following study questions:
    a. When do peaks for mentions containing #NewTwitter hashtag occur?
        i. You will be looking at global peak #1 15 September 2010
    b. What were the actions of Twitter during the peaks?
    c. How do users react to Twitter actions?
    d. Why do peaks for mentions containing #NewTwitter hashtag occur?
    e. How do users react to the change process?
    f. How has the change from #OldTwitter to #NewTwitter been accepted by users?
2. Keeping global peak #1 in mind please read through the 100 tweets (see appendix a section a. 3.1).
3. Read through the category list (see appendix a section a.3.2).
4. Using the category list read through the 100 tweets again, this time assigning a category to each tweet. Please write the category ID number next to the tweet.

a. Each tweet must be assigned as either: “Sentiment” Negative, “Sentiment” Positive or “Sentiment” Neutral
b. You can assign as many categories to each tweet as you feel appropriate.

5.4.3 Findings

An inter-rater reliability analysis using Fleiss's Kappa from a table of counts was performed to determine consistency among raters (Chang, 2011). However several mathematical difficulties were observed, these reiterated Foster, et al (2008):

- The coder's interpretations of the tweets caused a different set of codes to be assigned by different coders. Foster, et al (2008) states "one coder may ignore concepts that appear important to the first coder".

- The coder's were likely operating subconsciously with a reduced set of codes and prefer to use particular codes, rather than exploring the whole set of possible codes Foster, et al, (2008). For example it was apparent that the tweets that were translated to English (see chapter 5 section 5.3.2.6) could have caused confusion amongst the coders because they were not naturally clear. For example "OK. Vamos aguardar. Preciso testar o #NewTwitter. De cara dá uns calafrios. Dois, na verdade. E, uma aposta" was detected as Portuguese and translated to "OK. Let's wait. I need to test the #NewTwitter. Face gives one chills. Two, actually. And a bet". These tweets caused coders to only use high-level categories: positive sentiment, negative sentiment, neutral sentiment or spam. As 30% (n=30 out of n=100) tweets in the coders data set were non-English this difficultly was deemed significant. Furthermore examining the data set it was apparent that further limited coding occurred. In 40.3% (n=121 out of n=300) coders only used high-level categories.

- The number of codes can effect the ease of inter-rater reliability calculations i.e. the greater the number the easier it is for another rater to choose different terms even if the codebook contains detailed instructions on the condition in which the term should be used Foster, et al (2008). Due to the sizable number of codes (n= 13) provided to the raters the likelihood of this occurring was significant.

As a result of these difficulties the Fleiss Kappa of the high-level categories (positive sentiment, negative sentiment, neutral sentiment or spam) was tested (see appendix b section b.3.2):

Number of cases size = 100

Number of raters or instruments=4

Minimum score = 1

Maximum score = 4

Fleiss Kappa for 4 raters = 0.1490 SE = 0.0277

95% confidence interval = 0.0948 to 0.2032

The study found that the inter-rater reliability for the coders was found to be Fleiss Kappa = 0.1490 ($p< 0.0277$), 95% confidence interval (0.0948, 0.2032), therefore a 'slight agreement' was observed (Chang, 2011).

The lower inter-rater reliability score is unsurprising given the mathematical difficulties that occurred. However the test was repeated, this time the non-English tweets were removed from the dataset (see appendix b section b.3.3):

Fleiss Kappa

Number of cases size = 60

Number of raters or instruments=4

Minimum score = 1

Maximum score = 4

Fleiss Kappa for 4 raters = 0.2044 SE = 0.0379

95% confidence interval = 0.1302 to 0.2787

The study found that the inter-rater reliability for the coders without non-English tweets was Fleiss Kappa = 0.2044 ($p< 0.0379$), 95% confidence interval (0.1302, 0.2787), therefore a higher slight agreement was observed. However the higher 95% confidence interval indicated 'fair agreement' (Chang, 2011) this was not evident in the first test

5.4 Discussion

To answer research questions three, four and five (see chapter 1 section 1.4) a longitudinal OSN monitoring and analysis study was carried out that investigated how changes are introduced to OSNs, their effect on users and the factors that encourage change acceptance. The study was divided into two parts that investigated a real-world example of OSN change by observing the actions of an OSN change agent. Due to implacable timing, Twitter releasing a rapid restructure, this real-world example was chosen.

Initially a timeline was developed that documented Twitter activities for example blogs, help centre posts, Twitter profiles and media responses to Twitter actions. The timeline provided an external view of how Twitter progressed from the old user interface to the new user interface (#NewTwitter).

The timeline found that Twitter launched #NewTwitter on 14 September 2010. It began with a media launch at their headquarters accompanied by a blog post that provided a summary of #NewTwitter with a link to an advertisement on YouTube. Tweets from Twitter accounts were also sent containing links to the blog, YouTube video and external media posts that covered the launch. The study found that Twitter did not offer knowledge of the change prior to the launch but continually sent tweets concerning the change. An additional account @Feedback was also created to allow users to give opinions and communicate problems.

The timeline found that not all users had access to #NewTwitter from the beginning and that full access did not occur until 11 October 2010. During this time Twitter continued to tweet about #NewTwitter. Twitter also hosted a Q&A session allowing users to offer opinions or ask questions. Following this a more in-depth advertisement and blog was launched that was accompanied by a help centre that contained answers to FAQ.

After the roll out users were given the option to use #OldTwitter or #NewTwitter and after a month (7 November 2010) engagement with users ceased.

Using the timeline a Twitter change map was developed. The map considered Twitter activities before,

during and after the change deployment. It also took into account the change theories and approaches discussed in chapter 2 section 2.4.

The map identified that Twitter's change process primarily draws on Lewin (1951) three-step model for change management but also calls on Lippit (1958) seven-stage change management model. However as only external observations could be made as only steps 1 to 4 of Lippit (1958) model were observed. Additionally it appears that Lewin (1951) persuade step was extended to consider Ohlsson (2009) definition of conceptual change. Furthermore it was determined that Lewin (1951) refreeze step was not evident during the time.

The change map offers an understanding of Twitter's change approach however the change map does not identify Twitter's users reactions and or acceptance of the change. Thus failing to answer research question four (see chapter 1 section 1.4). To answer this a Twitter monitoring and analysis study was carried out.

The study took an overview of users reactions to change in Twitter, the study questions addressed were:

1. When do peaks for mentions containing #NewTwitter hashtag occur?
2. What were the actions of Twitter during the peaks?
3. How do users react to Twitter actions?
4. Why do peaks for mentions containing #NewTwitter hashtag occur?
5. How do users react to the change process deployed by Twitter?
6. How has the change from #OldTwitter to #NewTwitter been accepted by Twitter users?

This was done by investigating tweets that referenced the #NewTwitter hashtag during peaks. Research.ly 1000-day viral analytics data mine chart was used to identify and gather peaks in tweets about #NewTwitter over a 6-month period. There were 6 peaks and a total of 427,925 tweets and a sample of 600 tweets (the first 100 tweets from each peak) were coded using the GIA to discover why users were tweeting about #NewTwitter.

The study findings identified three key issues:

- Poor information was provided by Twitter regarding the new user interface and problem-solving,
- The lengthy roll out of the new user interface was frustrating,
- The use of community champions (fellow yet popular OSN users) encouraged change acceptance.

The study found that most of #NewTwitter mentions occurred during the first four weeks of its existence (n = 414,563). During the early stages of roll out (15 and 24 September peaks) tweet sentiments were positive (54%) as a result of initial user excitement. However as the roll out continued this decreased to 13%, 16 December peak. This was attributed to users misunderstanding the purpose of #NewTwitter, disliking the new user interface and its lengthy roll out. This led to users questioning how to go back to the old user interface (#OldTwitter).

Twitter attempted to reduce these negative reactions by endorsing a descriptive video produced by popular international musicians (community champions). This action increased positive sentiments temporarily but these soon became negative as reports of problems for example incomplete tweets, missing follower's lists and poor performance.

Additionally the study found that users were also comparing the change with prior negative experiences with other OSNs, most notably Facebook. During 16 December peak, users were having difficulty committing to or refusing to accept the change. As the peaks progressed users acceptance of the change decreased.

5.4.1 Strengths

The method used, longitudinal OSN monitoring and analysis, has become increasingly popular amongst researchers that have produced work that provides an understanding user requirements and engagement, competitive intelligence, methods for OSN resource retrieval and business function

support. For example studies such as Zabin and Jefferies (2008) produced a roadmap for companies that aim to achieve a variety of business objectives through Best-in-Class use of social media monitoring and analysis solutions; and Scanfeld et al (2010) who identified evidence of misunderstandings or misuse of antibiotics by monitoring Twitter mentions containing the words antibiotic and antibiotics.

However these studies have not looked at how changes are introduced in OSNs, their effect on OSN users and the factors that encourage change acceptance. Therefore the study contributes substantial knowledge concerning the deployment of OSN change, specifically radical restructuring. It provides an understanding of a live approach to change and users reactions to it, this has been viewed as highly valuable.

Therefore the results from the study have filled the gap in HCI research. Whilst also successfully answering research questions three and four (see chapter 1 section 1.4).

5.4.2 Weaknesses

The study presented two key weaknesses:

1. The study does not distinguish individuals with cp however this does not diminish the value of the study because the OSN users include individuals with cp as study one and two identified (see chapters 3 and 4). However the study creates a limitation because OSN users with cp are not distinguishable within the data set. This was attributed to OSN users with disabilities rarely disclosing their impairment within the technology. To overcome this future work is required that consults with the cp community to validate the findings presented. This limitation and future work is further discussed in chapter 10 section 10.3.

2. The fact that five of the six peaks occurred in the first three weeks of the Twitter change meant that the data did not provide a comprehensive detailed view of how the change occurred and users reactions to it, as the sample did not reflect the period equally or in its entirety. It was

determined that a follow-up study was required. The study would explore in more depth the user reactions to change in Twitter using an event-sampling method.

5.5 Part two: event sampling

5.5.1 Introduction

The first part of the study identified three key findings: poor information was provided by Twitter regarding the new user interface and problem solving and the lengthy roll out of the user interface was frustrating. Although the results were interesting the fact that five of the six peaks occurred in the first three weeks of the Twitter change meant that the data did not provide a comprehensive view of how the change occurred and users reactions to it because the sample did not reflect the period equally or in its entirety. It was determined that a follow-up study was required.

The remainder of this chapter will discuss the second study that investigated in more depth user reactions to change in Twitter over a six-month period. It used an event-sampling method where the first 100 tweets mentioning #NewTwitter on Tuesdays were collected.

It begins with identifying the study questions followed by method including data gathering and organization and ending with the findings.

5.5.2 Study questions

The study questions addressed were:

1. How do users react to Twitter actions?
2. How do users react to the Twitter change process?
3. How has the change from #OldTwitter to #NewTwitter been accepted by Twitter users?

5.5.3 Method

5.5.3.1 Defining population of concern

Similarly to part one (see section 5.2.5.1) the study was concerned with Twitter users that sent messages between 14 September 2010 to 28 February 2011 and mentioned #NewTwitter hashtag.

5.5.3.2 Sample frame

Similarly to part one the study gathered Twitter users reactions from 14 September 2010 to 28 February 2011 (see section 5.2.5.2). Again it was determined that a full sample would be too large to cover each day, though it needed to represent the period uniformly.

Research.ly was used to sample tweets every Tuesday during the period. This day was chosen because Sysomos (2010) identified that Tuesday is the most popular day for Twitter activity, accounting for 15.7%.

One hundred tweets were gathered on: 14th, 21st and 28th September; 5, 12, 19 and 26 October; 2, 9, 16, 23 and 30 November; 7, 14, 21 and 28 December 2010; and 4, 11, 18 and 25 January; and 1, 8, 15 and 22 February 2011.

5.5.3.3 Sample method for selection

Similarly to part one (see section 5.2.5.3) a sample size calculator was used to determine the number of tweets needed to reflect the subjects . The calculator determined that a total of 203,889 tweets mentioning #NewTwitter were sent. Using the same sample premise as part one, 100 tweets at each interval, a sample size of 2400 was collected.

5.5.3.4 Determining sample size

It was determined that the GIA method used in part one was appropriate (see section 4.6) and was used to organise and report this study.

5.5.3.5 Sampling and data collection

Similarly to part one the GIA was used to organise the gathered data.

5.5.3.6 Data cleaning

Research.ly was used to collect the Tuesday tweets sent from 14 September 2010 to 28 February 2011. One hundred tweets from each interval were copied to a word document and cleaned (see section 5.2.5.6).

However only tweets written in English were collected. The computer-aided language detection and translation tool used within part one, i.e. simple substitution of words in one natural language for words in another, was deemed inappropriate (see section 5.2.7.3.1). According to Sugandhi et al (2011) such translations do not produce a good translation of text because recognition of whole phrases and their closest counterparts in the target language is needed. This means the translated tweets were not naturally clear. For example one user tweeted "OK. Vamos aguardar. Preciso testar o #NewTwitter. De cara dá uns calafrios. Dois, na verdade. E, uma aposta" was detected as Portuguese and translated to "OK. Let's wait. I need to test the #NewTwitter. Face gives one chills. Two, actually. And a bet". This issue was also reconfirmed by the category consistency check (see chapter 5 section 5.4.4.3).

5.5.3.7 Close reading of text

Similarly to part one the raw tweets and memos were read repeatedly until familiarisation of the tweets was achieved.

5.5.3.8 Expansion of categories

The 35 categories developed in part one were used to code the Tuesday sample (see section 5.2.5.1.1). However some of the categories were too general for the purposes of this study. This was especially evident within categories: change ("change" explicit and "change" non-explicit) and user interface problems. As a result, 19 expansion categories were added to the category model which emerged from the data (see table 20).

No.	Category	Description
35	“Change” Comparing States	Tweets where reference is made to change specifically comparing #NewTwitter to #OldTwitter or vice versa.
36	“Change” Method: Negative	Tweets where reference is made to change specifically a negative comment/feedback regarding the method twitter used
37	“Change” Method: Positive	Tweets where reference is made to change specifically a positive comment/feedback regarding the method twitter used
38	“Change” Method: Neutral	Tweets where reference is made to change specifically a neutral comment/feedback regarding the method twitter used
39	“Change” Method: Questioning	Tweets where reference is made to change specifically questioning the method twitter used
40	“Change” Method: Suggestion	Tweets where reference is made to change specifically offering a suggestion to improve or an alteration regarding the method used
41	“Change” Miscellaneous	Tweets where reference is made to change but does not have a specific focus for example “Twitter is changing” or change is explicit but unrelated
42	“Change” Non-Acceptance	Tweets where reference is made to change specifically user non acceptance (refuse to use #NewTwitter)
43	“Change” Prevented	Tweets where reference is made to change specifically access to the change (#NewTwitter) is prevented
44	“Change” Questioning	Tweets where reference is made to change specifically questioning the necessity/reasoning for the change (#NewTwitter)
45	“Change” Transitory Acceptance	Tweets where reference is made to change specifically users likes or dislikes the change but has used #NewTwitter for a temporary time because they wanted to try it or they felt #NewTwitter was going to happen and the felt they should get used to it. They have since accepted the change
46	“Change” Transitory Non-Acceptance	Tweets where reference is made to change specifically users likes or dislikes the change but has used #NewTwitter for a temporary time because they wanted to try it or they felt #NewTwitter was going to happen and the felt they should get used to it. They have since not accepted the change and returned to #OldTwitter
47	“User Interface Problem” Access	Tweets where reference is made to the user interface or feature problems specifically accessibility for example user has a problem accessing #NewTwitter
48	“User Interface Problem” Aesthetics	Tweets where reference is made to the user interface or feature problems specifically aesthetics (appearance) of #NewTwitter for example user dislikes visual appeal or problem with the appearance for example background not being seen

49	“User Interface Problem” Operability	Tweets where reference is made to the user interface or feature problems specifically operability of #NewTwitter for example allowable functions are not working as expected
50	“User Interface Problem” Performance	Tweets where reference is made to the user interface or feature problems specifically performance of #NewTwitter for example response time
51	“User Interface Problem” Platform Compatibility	Tweets where reference is made to the user interface or feature problems specifically compatibility of #NewTwitter on different platforms for example browsers, operating systems, internet speed and mobile devices
52	“User Interface Problem” Recovery	Tweets where reference is made to the user interface or feature problems specifically how twitter recovers from reported issues
53	“User Interface Problem” Unspecified	Tweets where reference is made to the user interface or feature problems change but does not have a specific focus for example “Their are so many problems with #NewTwitter”

Table 19. Expansion (lower-level) categories.

An additional upper level category ‘help’ was also identified. This category referenced tweets where help is offered or asked. For example: “Dammit, #newtwitter is still only showing me one page of tweets. Why would it stop loading the rest?”.

Subsequently the category was divided into 2 expansion categories (“help” community and “help” System (see table 21)).

No.	Category	Description
54	“Help” Community	Tweets where reference is made to help specifically user asking other twitter users for help to use or not use #NewTwitter. This also includes media that send messages from external sources providing help.
55	“Help” System	Tweets where reference is made to help specifically user asking the system (#NewTwitter or Twitter official accounts) for help to use or not use #NewTwitter

Table 20. Expansion (lower-level) categories

5.5.3.9 Adjusting category model

The process of categorising the Tuesday sample created 22 additional categories. The network diagram developed in part one (see section 5.2.5.1.1) was adapted to include these expansion categories (see figure 79).

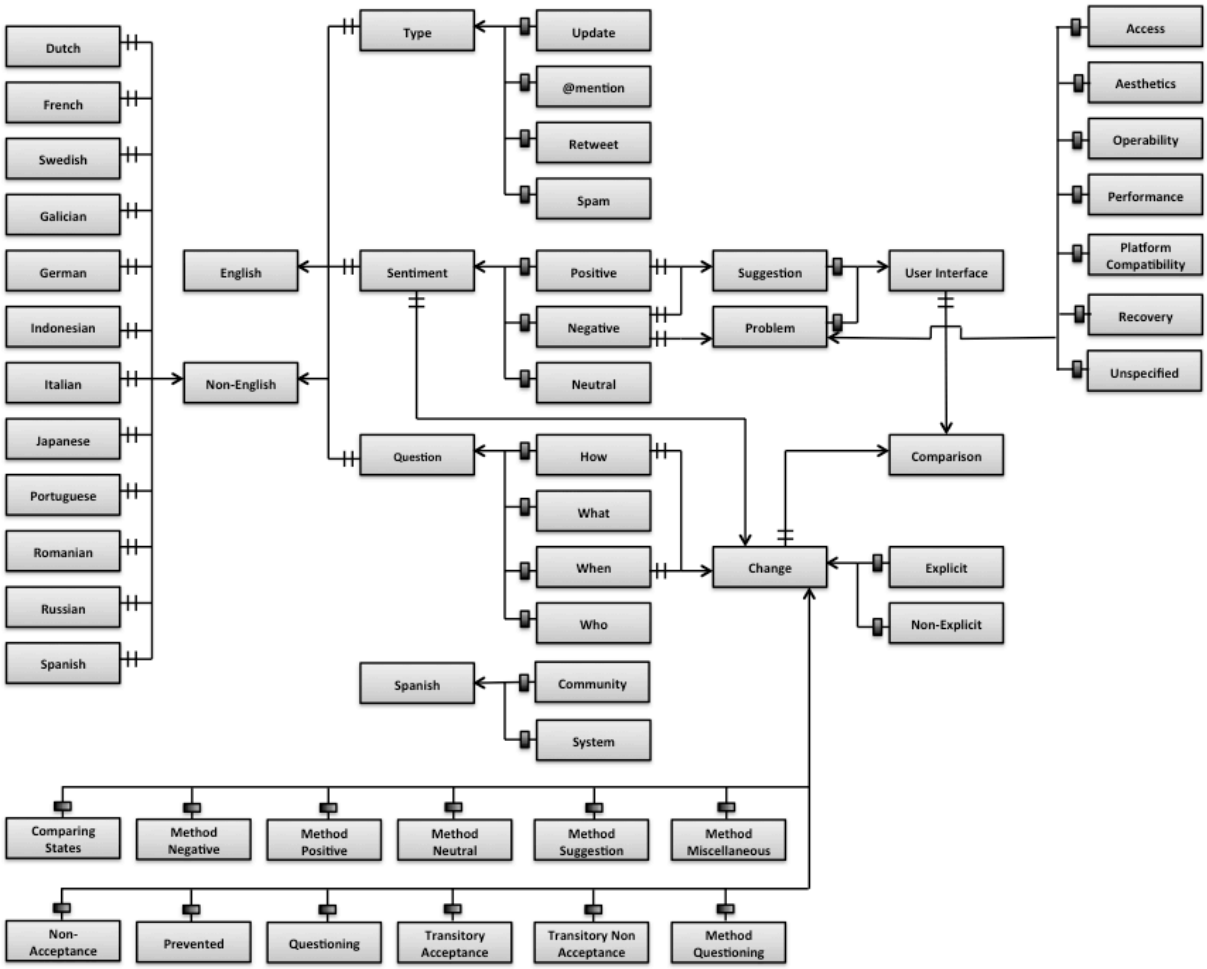


Figure 63. Adapted category network diagram.

5.3.3.10 Reporting the findings

Similarly to part one, a 25 by 47 category-document table was reported (see table 22 and appendix b section b.3.4 for sample data). However in this instance the output was difficult to understand and report due to the large data set. Additionally the report method used in part one was largely statistical. This suggested the tweets were of secondary importance.

To overcome this the primary document table was consulted (see table 21). The objective was to identify and explore patterns (important and or unexpected category frequencies), for example the category “Help: Community” averaged 10 responses throughout the sample. However on 7 and 14 December 2010 this increased to n=48 and n=43 respectively.

The patterns were further explored i.e. additional close reading of the related tweets took place (see section 5.5.3.7 and appendix b section b.3.4 for data sample)[17]. As a result key tweets that appropriately represented the pattern were identified, for example "Help: Community" tweets from 7 and 14 December 2010 were collected. It was identified that Twitter released a blog that offered additional information about #NewTwitter and it's new features "#NewTwitter just got newer with more photo's videos and music <url>" which became a popular retweet due to media outlets retweeting it, 76% of tweets referred to this. This caused users to try #NewTwitter, 48% of users were asking other Twitter users how to try #NewTwitter.

Additionally on 14 December 2010 Twitter users, especially it's developer community, began promoting a new browser plugin by Embedly.com, 43% of tweets pointed users to the new plugin website. The plugin allowed #NewTwitter to appear and function like the old user interface. This led to a popular retweet (achieving 30 retweets): "#Startup @embedly change, the face of twitter (for the better) <url> @masschalla #NewTwitter".

Finally statistical charts that were based on the category document table were developed. These illustrated users reactions, specifically categories frequencies, throughout the sample (see figure 80 and appendix a section a.3.3 for further examples).

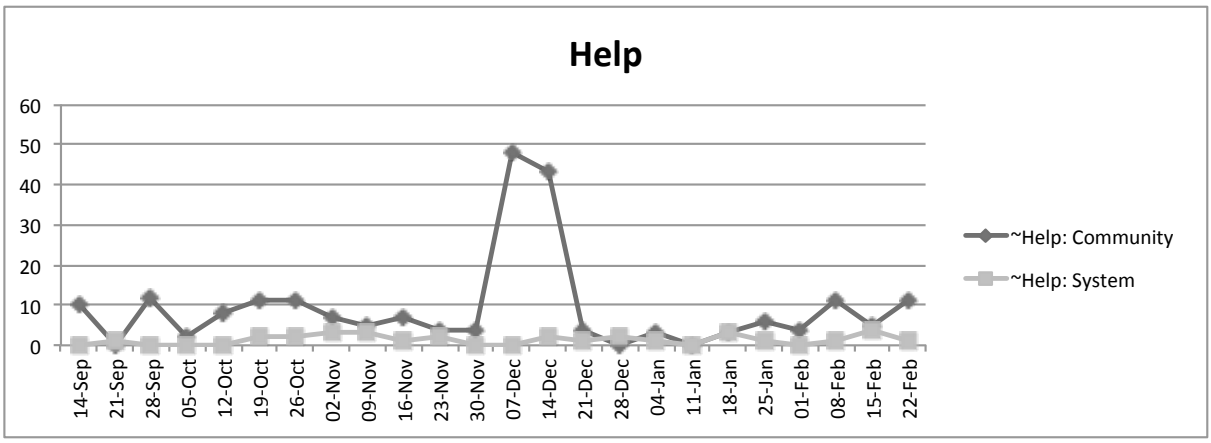


Figure 64. Statistical chart representing help (community and system) offered to Twitter users.

[17] The sample interval (see section 5.5.3.2) that these key tweets belonged was established and an appropriate interval stack was created (specifically Atlas.ti event sampling data was printed and relevant tweets were cut from each page and physical stacks were developed (see figure 83 image 1)).

As a result of the above method it was decided that a visual communication diagram (information graphic or infographic) be used to explore and disseminate the the large data set: category patterns, key tweets and category frequency charts An infographic was chosen because they are often used to display patterns and complex ideas lurking within large data sets effectively such as the data collected within this study (see figure 80 to 82 for infographic examples).

	Category-document																							
	14/09	**21/09**	**28/09**	**05/10**	**12/10**	**19/10**	**26/10**	**02/11**	**09/11**	**16/11**	**23/11**	**30/11**	**07/12**	**14/12**	**21/12**	**28/12**	**04/01**	**11/01**	**18/01**	**25/01**	**01/02**	**08/02**	**15/02**	**22/02**
Change:																								
Change: Non-Verbalized	0	1	5	6	11	18	12	10	11	14	9	16	0	1	22		18	25	16	15	23	18	47	25
Change: Verbalized	0	2	1	1	0	0	2	2	0	0	0	2	0	2	2	7	3	0	1	0	3	1	1	1
Change: Comparing States	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	4	1	2	2	4	4	3	0
Change: Method -> Negative	0	1	2	1	1	7	2	2	1	4	2	1	0	0	9	1	1	10	1	1	0	1	7	0
Change: Method -> Neutral	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0
Change: Method -> Positive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Change: Method -> Questioning	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	1	1	0	0	0	1
Change: Method -> Suggestion	0	1	0	0	0	6	1	0	0	5	0	0	0	0	0	0	1	0	1	0	0	0	3	0

Change: Miscellaneous	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0	5	1	1	0	0	1	0	0	0
Change: Non-Acceptance	0	1	3	2	1	6	1	0	2	1	3	3	0	0	6	3	3	2	1	2	0	3	10	5
Change: Prevented	0	0	0	0	2	1	0	2	1	0	1	0	0	0	0	1	2	1	2	4	2	0	2	8
Change: Questioning	0	0	0	0	1	0	1	0	1	1	0	1	0	0	1	0	0	4	0	0	3	0	0	1
Change: Transitory Acceptance	0	0	0	2	4	3	3	3	2	0	0	9	0	0	6	3	4	3	5	2	5	6	13	2
Change: Transitory Non-Acceptance	0	1	0	1	4	2	7	4	6	1	3	3	0	1	4	8	5	8	5	3	11	1	8	8
Help:																								
Help: Community	10	0	12	2	8	11	11	7	5	7	4	4	48	43	4	0	3	0	3	6	4	11	5	11
Help: System	0	1	0	0	0	2	2	3	3	1	2	0	0	2	1	2	1	0	3	1	0	1	4	1
User Interface Problems:																								
User Interface (UI): Problems	2	4	2	5	12	18	11	20	18	12	15	8	4	9	10	23	16	8	21	32	9	17	7	11
UI Problem: Access	0	0	0	0	1	1	0	2	1	1	2	0	0	0	1	2	1	1	3	1	2	1	2	7
UI Problem: Aesthetics	1	1	0	0	1	0	1	3	2	1	3	1	0	3	3	0	1	0	0	3	0	3	0	0
UI Problem: Operability	1	1	0	4	8	9	9	13	13	8	5	4	2	2	2	14	6	2	9	16	3	7	3	1
UI Problem: Performance	0	0	0	1	0	4	0	1	1	0	3	2	0	1	2	0	2	4	8	4	2	6	0	0

UI Problem: Platform Compatibility	0	1	0	0	2	0	0	2	1	1	1	0	0	1	2	3	2	1	2	1	2	1	0	1
UI Problem: Recovery	0	1	0	0	0	1	0	0	1	0	0	0	1	2	0	2	2	0	1	3	0	0	0	0
UI Problem: Unspecified	0	0	2	0	0	1	1	1	0	0	2	0	1	1	0	2	2	1	2	4	2	0	2	1
Language:																								
English	36	17	59	54	63	65	52	60	57	65	71	58	77	76	65	73	60	72	70	69	66	76	76	76
Non-English	63	83	41	46	37	35	48	40	43	35	29	42	23	24	34	27	40	28	30	31	34	24	24	24
Question:																								
Question: How	1	1	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Question: What	8	0	4	1	1	2	3	4	1	9	2	2	6	1	1	0	0	1	4	4	1	8	0	0
Question: When	6	3	3	5	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Question: Who	10	1	22	7	5	0	1	5	2	1	3	1	0	0	0	0	0	0	1	1	0	0	1	0
Sentiment:																								
Sentiment: Negative	18	7	54	24	28	38	19	31	33	35	46	26	4	14	47	55	30	43	44	42	27	40	49	46
Sentiment: Neutral	9	4	10	11	10	10	18	15	12	9	14	13	3	5	7	4	12	5	5	10	16	19	10	10
Sentiment: Positive	7	4	36	17	17	14	8	11	8	13	8	15	67	52	7	8	10	14	6	6	8	9	13	5
Tweet:																								
Type: @ Mention	3	1	12	14	12	16	15	14	18	11	9	20	2	16	13	20	14	12	16	20	15	13	18	20
Type: Retweet	64	68	27	16	10	14	21	8	16	19	31	20	21	30	10	9	9	11	14	4	29	9	11	11
Type: Update	32	30	61	68	73	70	64	78	67	69	60	60	76	54	76	71	77	77	70	71	56	78	71	69
Spam	0	1	0	1	7	3	5	3	5	7	5	5	2	5	4	5	7	10	13	7	15	6	5	15
Other:																								
Comparison	3	1	7	5	6	3	0	5	2	5	2	2	40	41	2	6	3	3	4	2	4	4	1	3

User Interface: Suggestions	0	0	0	3	1	2	3	2	5	3	1	6	6	2	0	1	0	2	0	2	0	1	0	1

Table 21. Category-Documents Table (see appendix a section a.3.3. for graphical representation).

Figure 65. Infographic examples: 1) map illustrating the popularity of online communities, 2) depicting the development (movement from state A to state B) of a product; 3) demographics list; and 4) step to step guide.

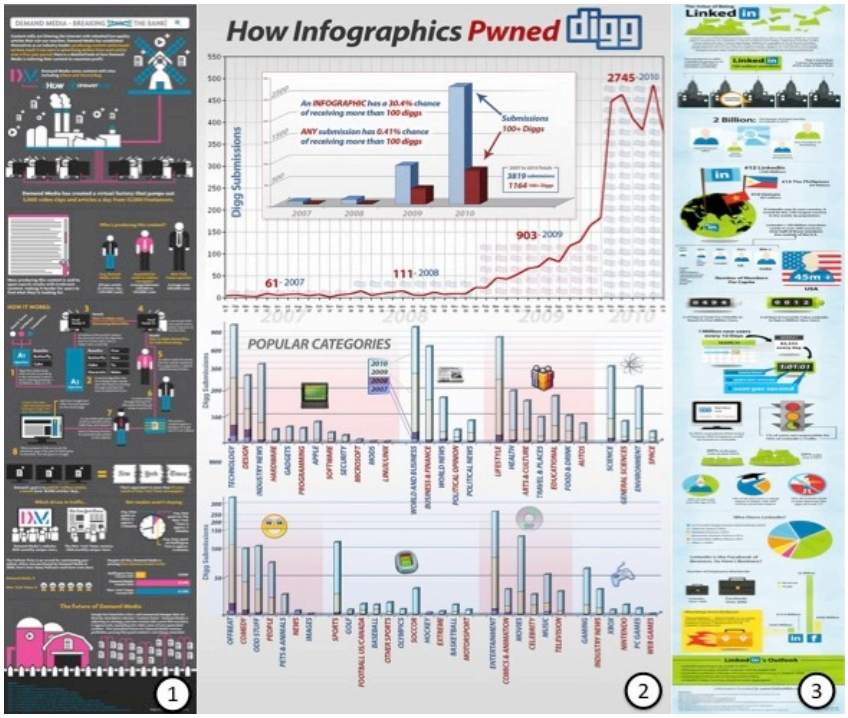


Figure 66. Examples of effective low graphicacy infographic elements: 1) pictograms; 2) charts; and 3) pictograms and charts.

Figure 67. Examples of Infographic depicting movement (1) or time (2).

5.5.3.11 Infographic

Using the category patterns, key tweets and category frequency charts a paper-based infographic that represented the Twitter change approach and users reactions was developed (see figure 83).

The infographic stated: “2400 tweets mentioning #NewTwitter between 14 September 2010 to 28 February 2011 were analysed of which 63% were updates 19% Retweets and 5% spam; 63% were written in English and were mostly sent from South America (34%). The infographic illustrates Twitter users responses to the deployment of #NewTwitter, it uses a vertical timeline that also accounts for Twitters actions and media responses ”.

The following four sections will discuss the infographic development.

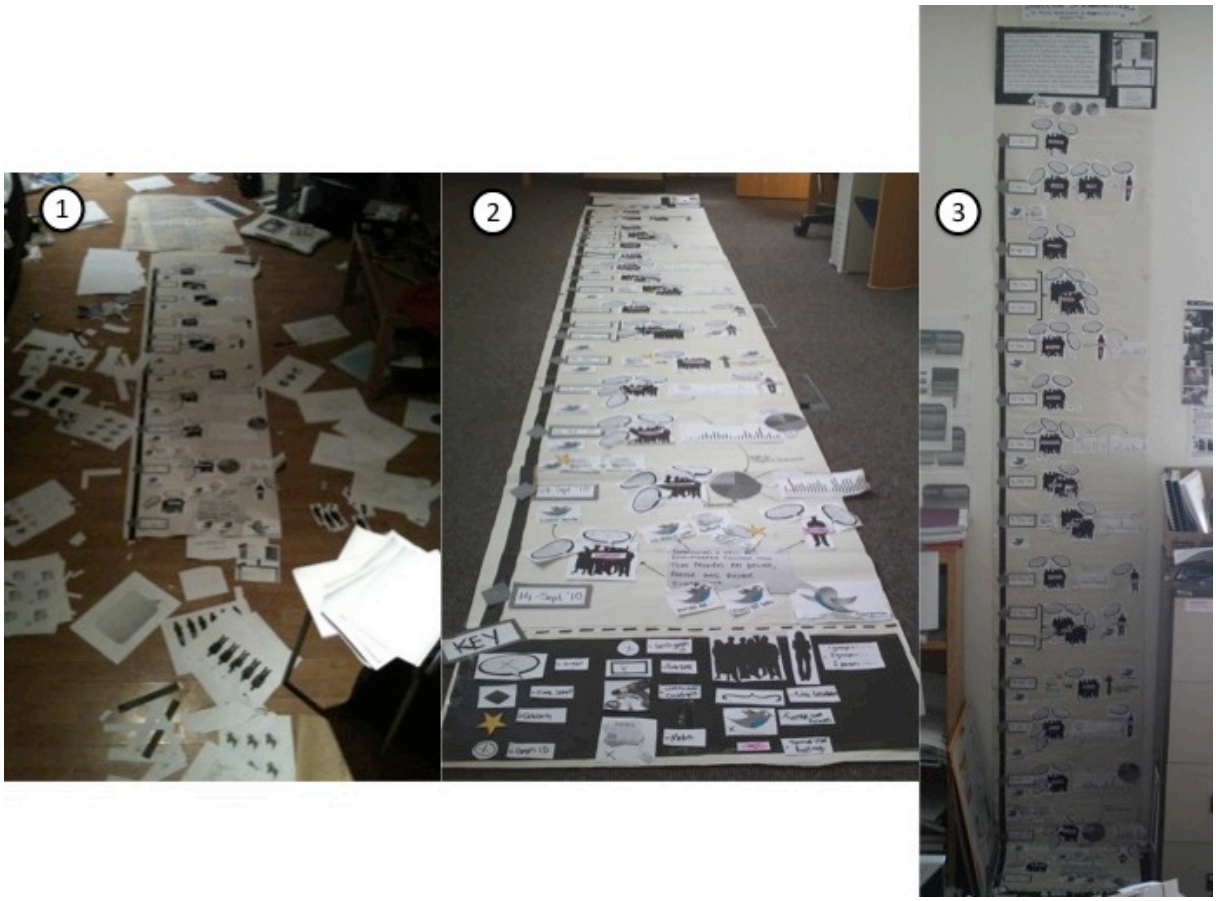


Figure 68. Infographic development (1) initial construction on living room floor, (2 and 3) completed infographic: horizontal and vertical.

5.5.3.11.1 Apparatus and materials

The following apparatus and materials were required to develop the infographic:

APPARATUS

- Fine Tip Marker Pens (Black and Purple),
- Black pen,
- Highlighter,
- Blue-Tac,
- Scissors,
- Sticky tape,
- Plain A4 paper,
- A2 Flip chart paper.

MATERIALS

- Category-documents table (see table 21),
- Atlas.ti report of sample data (see appendix b section b.3.4 for example),
- Category Network Diagram (see chapter 5 section 5.3.3.9),
- Statistical charts based on category-document table (see appendix a section a.3.3),
- Black and white elements printouts (see chapter 5 section 5.5.3.11.2 for elements key),
- Timeline of Twitter actions (see chapter 5 section 5.2.1),
- Oxford English dictionary.

5.5.3.11.2 Elements key

According to Agrawala, et al (2011:1): “effective visualisations are time-consuming and require considerable effort, but if an appropriate element key is developed early on these issues will be elevated”. Using guidelines developed by Wong (2010), Newsom and Haynes (2004) and Milson (1987) alongside infographic examples (see figures 80-83) an element key was developed (see figure 84). The infographic key included:

- Pictograms (element 1), these were used to illustrate users reactions (tweets),
- Timeline stamps (element 2), these represented a specific sample interval,
- Celebrity intervention (element 3), these represented the use of a community champion (a fellow yet popular OSN user),
- Graphs and charts (element 4 and 5), these represented the primary document table

specifically category frequencies,

- Timeline dates (element 6), these represented to sample intervals,
- Community developers (element 7), these represented specific reactions from Twitter's developer community, these individuals were also viewed as community champions.
- Media and twitter actions (element 8 and 11), these represented twitters actions and media response to said actions. These actions were identified in the Twitter change timeline developed in section 5.2.1,
- Twitter users (element 9), these represented one or more twitter users whom had or shared a specific reaction. For example a single person illustration of a user represented a single reaction whereas an illustration of a group represented a shared reaction such as a popular retweet,
- Users feelings (element 12), these represented a collected feeling of users reactions (see section 5.5.4.3 for further explanation).

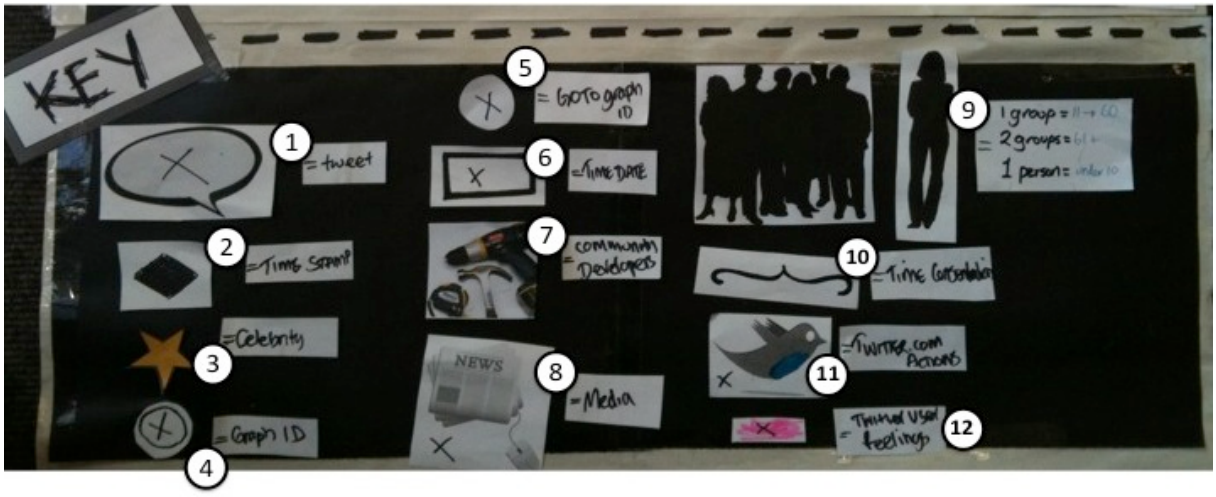


Figure 69. Elements key.

5.5.3.11.4 Protocol

The following protocol was followed to construct the infographic:

1. Nine pages of A2 flip-chart paper were stuck together with sticky tape,

2. A black line on the left hand side of the flip-chart was drawn to represent the timeline,

3. Equally spaced diamond time stamps (element 2) were used to represent sample intervals,
    a. Using black marker pen write date next to element 6 and blue-tac next to element 2,

4. First diamond time stamp use category-documents table (see table 21), Atlas.ti report of tweets, and the Twitter timeline (see chapter 5 section 5.2.1):
    a. Read Atlas.ti report of tweets until a clear understanding of what has occurred is established,
    b. Compare 4a to summary timeline:
        i. If 4b is a result of Twitter action use element 11 and copy summary information to element using a black marker pen,
        ii. If 4b is a result of media use element 8 and copy summary information to element using a black marker pen,
        iii. If 4bi or 4bii includes a celebrity blu-tac element 3 to element 11 or 8,
        iv. If 4b is a result of community developers use element 7 and copy summary information to element using a black marker pen,

    c. Highlight 4a "key" tweets within Atlas.ti report of tweets[18],

    d. Using a black marker pen copy 4c to element 1 (using a black pen identify and copy 4a category using category-documents table to 4d),
        i. If under 10 tweets represent 4c blu-tac 4d to element 9 (person),
        ii. If between 11 to 60 tweets represent 4c blu-tac 4d to element 9 (group),
        iii. If over 60 tweets represent 4c blu-tac 4d to element 9 (2 groups),

    e. Using Oxford English dictionary and a black marker write the overall feeling conveyed within 4c on element 12 (to be discussed further in section 5.5.4.3),
        i. Highlight element 12 and blu-tac it to element 9,

[18] Tweet(s) that represent user reactions during a specific interval.

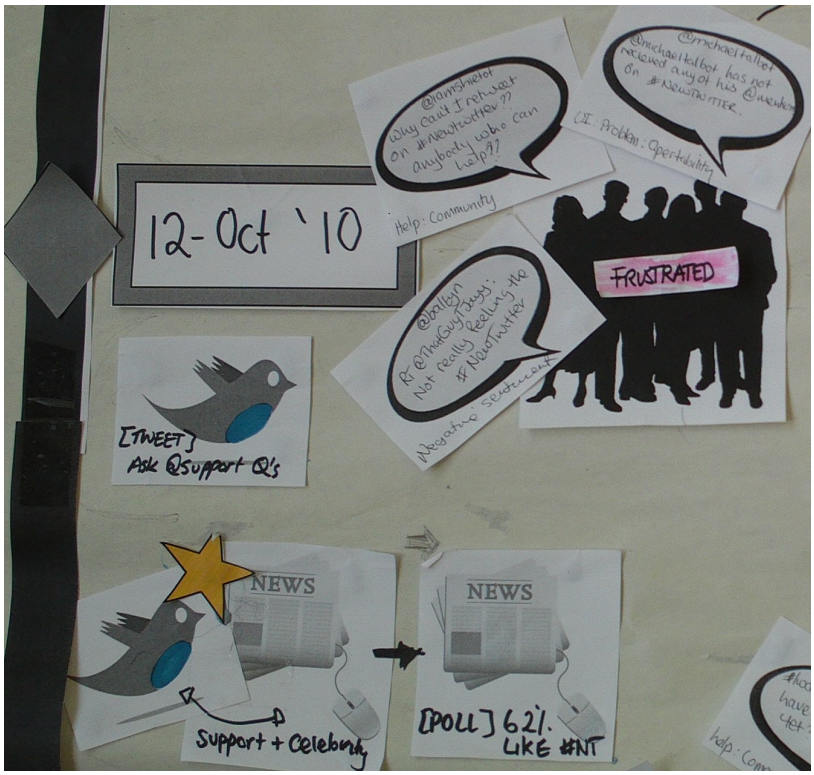


Figure 70. Example of step 2-4.

f. Using category-documents table to enhance 4a by using a chart (to be discussed further in section 5.3.4.2),

   i. Using element 5 add an identifier to the chart,

   ii. If 4f already exists on the infographic use element 5 and a black pen to link to 4fi,

g. Using black maker draw arrows between 4b and 4f,

   i. If 4f is a result of another 4f, draw arrow and give brief explanation using a black marker pen,

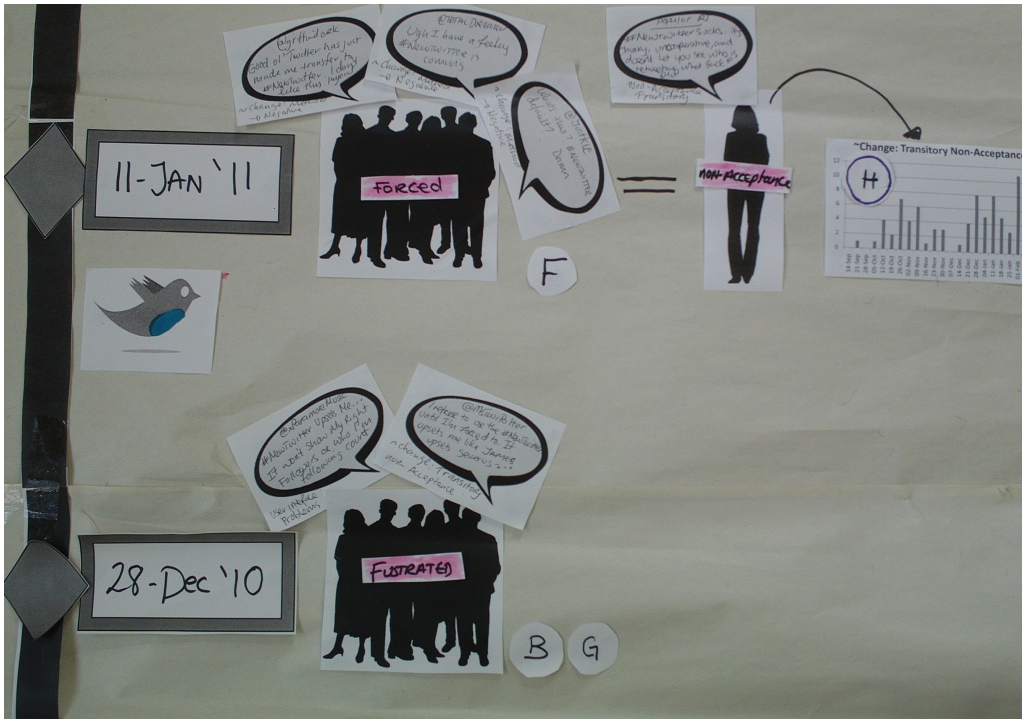


Figure 71. Example of step 4f-g.

h. If 4a is similar across multiple intervals, 3 use element 10 next to 3a,

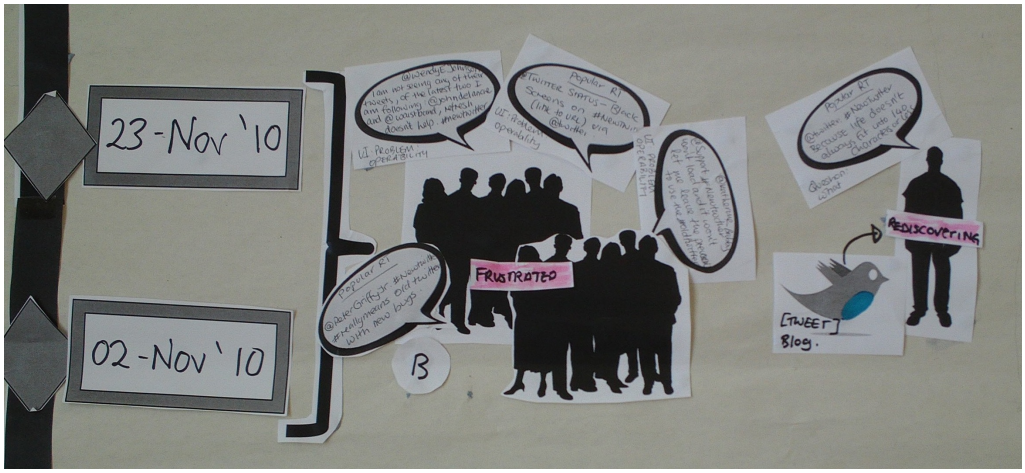


Figure 72. Example of step 4h.

5. Repeat 4 until all intervals are complete.

5.5.4 Findings

The study findings were expressed using a infographic (see section 5.5.4.1) and a summary of each key Tuesday interval (see section 5.5.4.2).

5.5.4.1 Infographic

The paper infographic was over 4.5 metres long and very fragile (see pull-out for a stitched-together high resolution photograph). As a result a replica electronic version was developed in PowerPoint (see pullout).

Please view CD-ROM for paper-based Infographic (Stitched-Together High Resolution Image)

Please view CD-ROM for Electronic

Infographic Image

5.5.4.2 Intervals summary

To support the infographic a summary of the key Tuesday intervals is provided.

5.5.4.2.1 Section Number 1 - 14 September 2010

#NewTwitter was introduced to users through a public tweet: “Introducing a new, reengineered twitter.com that provides an easier, faster and richer experience” followed by a YouTube advert and blog that offered basic information about the new user interface.

Twitter also sent an invitation to media to view the new interface at their headquarters. After which media outlets began to offer opinions and screenshots. This resulted in Twitter users anticipation and confusion. They were excited to get #NewTwitter, 10% of tweets asked who had it, 6% of tweets asked when they would get it, but did not understand the roll out approach, 10% of users asked other Twitter users how to get it, this led to a popular retweet (achieving 64 retweets) “RE**TWEET if you still haven’t gotten the invitation to the #newtwitter”. Three Twitter users described:

> **Example 1:** “@ItsBDAYbash: so if #newtwitter dropped 14th, why does mine look the same?”.
>
> **Example 2:** “@youSEREMTatiy: wt* is #newtwitter?”.
>
> **Example 3:** “@WonderWomenRay: ok so wen we gettin the #newtwitter?”.

5.5.4.2.2 Section Number 2 - 28 September 2010

Twitter users that did not have #NewTwitter were becoming highly impatient. 10% of tweets asked who had it, 12% of tweets were asking other twitter users how to get it and overall 54% of tweets were negative concerning the roll out approach. This caused a popular retweet “RETWEET if you don’t have the #newtwitter”. Two Twitter users described:

> **Example 4:** “@ericjunior: I keep logging out and logging back in to see if any account has been updated with #newtwitter”.

Example 5: "@PatzerO #Iwanttoknowwhy I don't have #newtwitter yet?".

5.5.4.2.3 Section Number 3 - 12 October 2010

During this period Twitter, through their @support profile, began to respond to users questions and opinions about #NewTwitter. As a result users responded with concerns about #NewTwitter user interface and the problems they were facing. Twelve percent of tweets related to problems with operability specifically not receiving @mentions. The tweets during this period were negative, 28% compared to 17% positive, and illustrated users frustrations. Three Twitter users described:

Example 6: "@baltyn RT @that guyTjayy: not really feeling the #newtwitter".

Example 7: "@iamshietot why can't retweet on #newtwitter?? anybody who can help??".

Example 8: "@michealtalbot: @michaeltalkbot has not received any of this @mentions on #NewTwitter".

5.5.4.2.4 Section Number 4 - 19 October 2010

Eight days after roll out of #NewTwitter(11 October 2010) Twitter users were still not content, 38% of tweets were negative compared to 14% positive. Twitter users were not accepting the new interface and wanted to keep using the old user interface, 6% of tweets reported non-acceptance.

During this period Twitter presented a blue bar at the top of the page asking users to try #NewTwitter. This led to a popular retweet (achieving 14 retweets) "Twitter will soon be gone. Please RT if you prefer #oldtwitter to #newtwitter and think it should be available as an option", 6% of tweets reported this suggestion.

Additionally Twitter users disliked the change method, 7% of tweets reported this, whilst 18% reported problems, specifically operability and platform compatibility, with the new user interface. Three Twitter users described:

Example 9: "@streetsambeatz This blue bar on the top of my twitter page is getting on my f***** nerves.... F**** YOU #newtwitter lol".

Example 10: "@julie_SIP how the h*** do you log out of #newtwitter? OMG this is such a #fail".

Example 11: "@sarahfrank1 stop trying to make me convert to the #newtwitter. I won't do it!".

5.5.4.2.5 Section Number 5 - 26 October 2010

Twitter began to deal with #NewTwitter problems by offering status updates through tweets and a blog, 11% of tweets referred to a problem status. They also addressed users concerns about the usability of #NewTwitter by tweeting a link to an audio file describing the process. Both actions reduced negative tweets from 38% during the last interval to 19%, and increased neutral tweets from 10% to 18%.

Additionally media outlet MTV began a new related hashtag #taylorNYC that encouraged Twitter users to watch Taylor Swift (a USA celebrity musician) New York City performance through the new user interface. This led to a popular retweet "@MTV: watch #taylorNYC embedded in #NewTwitter" (achieving 21 retweets). This action encouraged users to try #NewTwitter, 11% of users asked other twitter users how to try #NewTwitter.

5.5.4.2.6 Section Number 6 - 2 to 23 November 2010

#NewTwitter was experiencing vast problems related to operability and platform compatibility, 20% of tweets reported this, causing 46% of tweets to be negative compared to 14% positive. Twitter responded with tweets informing users that they were aware of the issues. This led to a popular retweet "@petegriffyJr: #newtwitter #reallymeans old twitter with new bugs". Two Twitter users described:

Example 12: "@wendyejohnson: I am not seeing any of their tweets, of the latest two I am following @jondelancre and @waistband, refresh doesn't help. #newtwitter".

Example 13: "@vatherue: @support #newtwitter won't load and it won't let me leave the preview to use the #oldtwitter".

Additionally Twitter released a blog that provided additional information about the new interface with a slogan "#newtwitter because life doesn't always fit into 140 characters or less", this became a popular retweet (achieving 31 tweets) and caused users to revisit the new interface, 7% of tweets reported trying #NewTwitter but disliking it. One Twitter user described:

Example 14: "Twitter status-black screen on #newtwitter (link to url) via @twitter".

5.5.4.2.7 Section Number 7 - 30 November 2010

Twitter users were reporting problems with #NewTwitter specifically operability, 8% of tweets reported this. This led to a popular retweet to Twitter's official profile offering a solution "@twitter when u launched #newtwitter why didn't u enable RT w/ comments? it is such a pain". However users were also getting used to the new interface, 9% of tweets reported this. Two Twitter users described:

Example 15: "@Paulorenato1995 RT: @miiszMocha: I'm try na get adapted to this #newtwitter ish but I'm thinking this s*** needs to be chucked out of twitter".

Example 16: "@lussahere_ RRTRRT if u r already gettin' used to the #newtwitter and don't hate it a lot now... RTRTRT".

5.5.4.2.8 Section Number 8 - 7 December 2010

Twitter released a blog that offered additional information about #NewTwitter and it's new features "#newtwitter just got newer with more photo's videos and music <url>" which became a popular retweet due to media outlets retweeting it, 76% of tweets referred to this. This caused users to try #NewTwitter, 48% of users were asking other Twitter users how to try #NewTwitter. This resulted in an increase in positive tweets (67%) compared to 3% negative.

5.5.4.2.9 Section Number 9 - 14 December 2010

Twitter users, especially it's developer community, began promoting a new browser plugin by Embedly.com, 43% of tweets pointed users to the new plugin website. The plugin allowed #NewTwitter to appear and function like the old user interface. This led to a popular retweet "#Startup @embedly change, the face of twitter (for the better) <url> @masschalla #newtwitter" (this resulted in 30 retweets).

5.5.4.2.10 Section Number 10 - 21 December 2010

On 16 December 2010 #NewTwitter changed from user opt-in to opt-out offering a new introductory message "Welcome to #newtwitter you can still access old twitter for a limited time". Five days later users were still feeling 'forced' to use #NewTwitter, 9% of tweets referenced this. Therefore Twitter users were reluctant to change citing user interface problems such as aesthetics, operability, performance and platform compatibility as a reason. Three Twitter users described:

> **Example 17:** "@tahirrah stop forcing me to use #newtwitter".
>
> **Example 18:** "@damkinsen FACT: #newtwitter is a bandwith sucker (cc @TMN) #mobileboardband #sucks #bigtime".
>
> **Example 19:** "@fashionbrebs 'welcome to #newtwitter you can still access old twitter for a limited' stfu, I want the old twitter forever lol".

5.5.4.2.11 Section Number 11 - 28 December 2010

Twitter users were still experiencing #NewTwitter problems specifically operability, 20% reported this. Additionally 16% of users were still disliking the new opt-out method causing non acceptance of #NewTwitter, 8% of tweets reported this. Two Twitter users described:

> **Example 20:** "@txparamoremusic #newtwitter upsets me... It won't show my right followers or who I'm following count".

Example 21: "@mstwipotter I refuse to use the #newtwitter until I'm forced to. It upsets me like James upsets Severus...".

5.5.4.2.12 Section Number 12 - 11 January 2011

10% of Twitter users were frustrated by the new opt-out method because they did not like being forced to use the #NewTwitter. They were choosing to return to the old user interface, 8% of tweets report this resulting in a popular retweet "#newtwitter sucks. Its chunky, uncooperative, and doesn't let you see who is retweeting what, back to old" (this achieved 11 retweets). Three Twitter users described:

Example 22: "@griffindoak good ol' twitter has just made me transfer to #newtwitter. I don't like this layout".

Example 23: "@totaldreamer Ugh I have a feeling #newtwitter is coming".

Example 24: "@JustKLE what's this? #newtwitter default? damn".

5.5.4.2.13 Section Number 13 - 18 and 25 January 2011

Twitter users were reporting problems with #NewTwitter specifically operability and performance, this caused frustration across 32 users. Four Twitter users described:

Example 25: "@patuckie: @twitter #newtwitter is slow and slows up my whole pc... just sayin!".

Example 26: "@bramme the #newtwitter is dope and all, but once I start scrolling down pages it filters. #fails".

Example 27: "@russellcrow I though I was only one not able to see past 1 hour back on #newtwitter".

Example 28: "@bennytan28 now. I haven't been on #newtwitter idea not on my, phone... I had no idea there was a #newtwitter how new is it?".

5.5.4.2.14 Section Number 14 - 1 February 2011

Twitter users were discontented with #NewTwitter user interface and were choosing or threatening to return to the old user interface, 4% of tweets compared the old user interface with the new, 8% questioned it's purpose whilst 11% reported non acceptance of #NewTwitter. Three Twitter users described:

> **Example 29:** "@lovebustinjiebs RT @TheBieberBear: GUYS... lol I just spent 10 minutes trying to figure out how to get out of #newtwitter".
>
> **Example 30:** "@DJQ_KC I accidentally clicked on the #newtwitter and it wasn't let go back".

5.5.4.2.15 Section Number 15 - 15 February 2011

Twitter released a questionnaire asking users about their experiences, concerns and why they were not accepting #NewTwitter. Twitter users responded positively to this inclusion and began to try #NewTwitter, 10% of tweets report acceptance whilst 8% reported non-acceptance. This action resulted in a popular retweet "Trying to get used to the #newtwitter".

During this time non-acceptance of the new interface also increased from 3% during the last interval to 10%. Three Twitter users described:

> **Example 31:** "@torimonague I switched to #newtwitter because I need to get with the times LOL".
>
> **Example 32:** "@konrave: @tealeaf_ I don't mind change, as long as it improves whats changing #newtwitter is an improvement".
>
> **Example 33:** "@neversaykenny who still uses the old twitter? I do because I cannot stand the #newtwitter".
>
> **Example 34:** "@ToserrKidtonten: RT @shneoneat: I like the way twitter is giving me a change to say why I've not switched to #newtwitter".

5.5.4.2.16 Section Number 16 - 22 February 2011

During this period Twitter users were returning to the old user interface, 8% of tweets reported non acceptance of the change because they disliked the change process or user interface problems specifically access to #NewTwitter. 8% users reported being logged out of #NewTwitter. Two Twitter users described:

> **Example 35:** "@jameconsistency: @imapushshercady #twitter randomly switches from #oldtwitter to #newtwitter and then blames me".
>
> **Example 36:** "@ratmauu: RT nevermind, I couldn't handle use #newtwitter. Back to respectful #oldtwitter".

5.5.4.3 User feelings

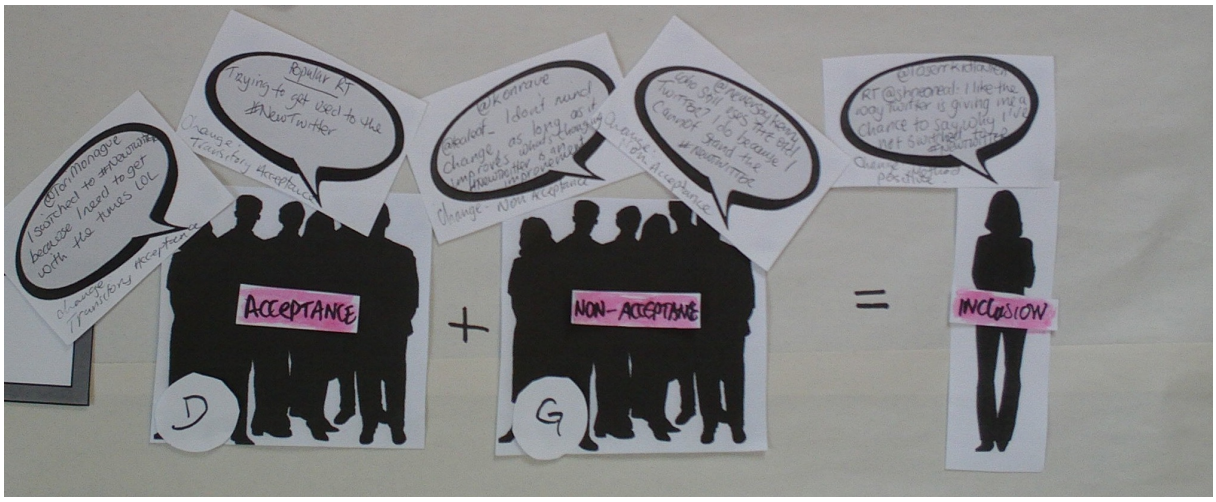


Figure 73. Highlight from infographic concerning user feelings

A summary of Twitter users feelings was expressed within the infographic (see figure 88). This summary represented a group of tweets during each interval. Each tweet was read repeatedly until an understanding of users feelings covered in the tweets was achieved. Using the Oxford English Dictionary (2010) a word that described the group of tweets was used (see section 5.3.3.11.4 for protocol). These included:

- Confused, to perplex or bewilder for example Twitter users were not sure what #NewTwitter is,

- Anticipating, to expect; look forward to: to anticipate a favorable action for example Twitter users were excited for roll out to reach their account,
- Impatience, lack of patience; eager desire for relief or change; restlessness for example Twitter users wanting roll out to happen,
- Frustrated, having a feeling of or filled with frustration; dissatisfied for example difficulty left him absolutely frustrated for example Twitter users frustrated with #NewTwitter problems,
- Discontented, not content or satisfied; dissatisfied; restlessly unhappy for example Twitter users do not want #NewTwitter to be deployed, they dislike the approach used,
- Solving, to work out the answer or solution for example Twitter users suggesting or developing solutions to Frustrations,
- Experiencing, the observing, encountering, or undergoing of things generally as they occur in the course of time for example Twitter users trying #NewTwitter,
- Rediscovering, discover again; (discover: to see, get knowledge of, learn of, find, or find out; gain sight or knowledge of (something previously unseen or unknown) for example Twitter encouraging its users to try #NewTwitter and users taking up this offer,
- Acceptance, the act of taking or receiving something offered; favorable reception; approval; favor for example Twitter users using #NewTwitter,
- Non-Acceptance, the not act of taking or receiving something offered; unfavorable reception; disapproval for example Twitter users not using #NewTwitter,
- Forced, to compel, constrain, or oblige (oneself or someone) to do something for example due to Twitter approach users feel they are being forced to use #NewTwitter,
- Included, to contain as a part or member, or among the parts and members, of a whole for example Twitter asking users their opinions,
- Prevented, to hinder or stop from doing something for example Twitter preventing its users using #OldTwitter.

As a result a tweet summary chart was developed (see figure 89). The chart provided a summary of feelings expressed by Twitter users during each interval. These corresponded to the timeline of the sample period. Additional key actions by Twitter and media outlets were included because they influenced or initiated user feelings.

For example #NewTwitter was introduced to users through a public tweet, a YouTube advert and blog that offered basic information about the new user interface. Twitter also sent an invitation to media outlets to view the new interface at their headquarters, after which media outlets began to offer opinions and new user interface screenshots. These actions were advertisements. This advertising resulted in user anticipation, confusion and impatience (see section 5.3.4.2.1 and figure 89).

The chart also indicated the order in which feelings were presented. For example twitter users were ‘confused’ about what #NewTwitter was. This became clear through advertisements that led to ‘anticipation’. However due to a lengthy roll out Twitter users grew ‘impatient’ (see figure 89).

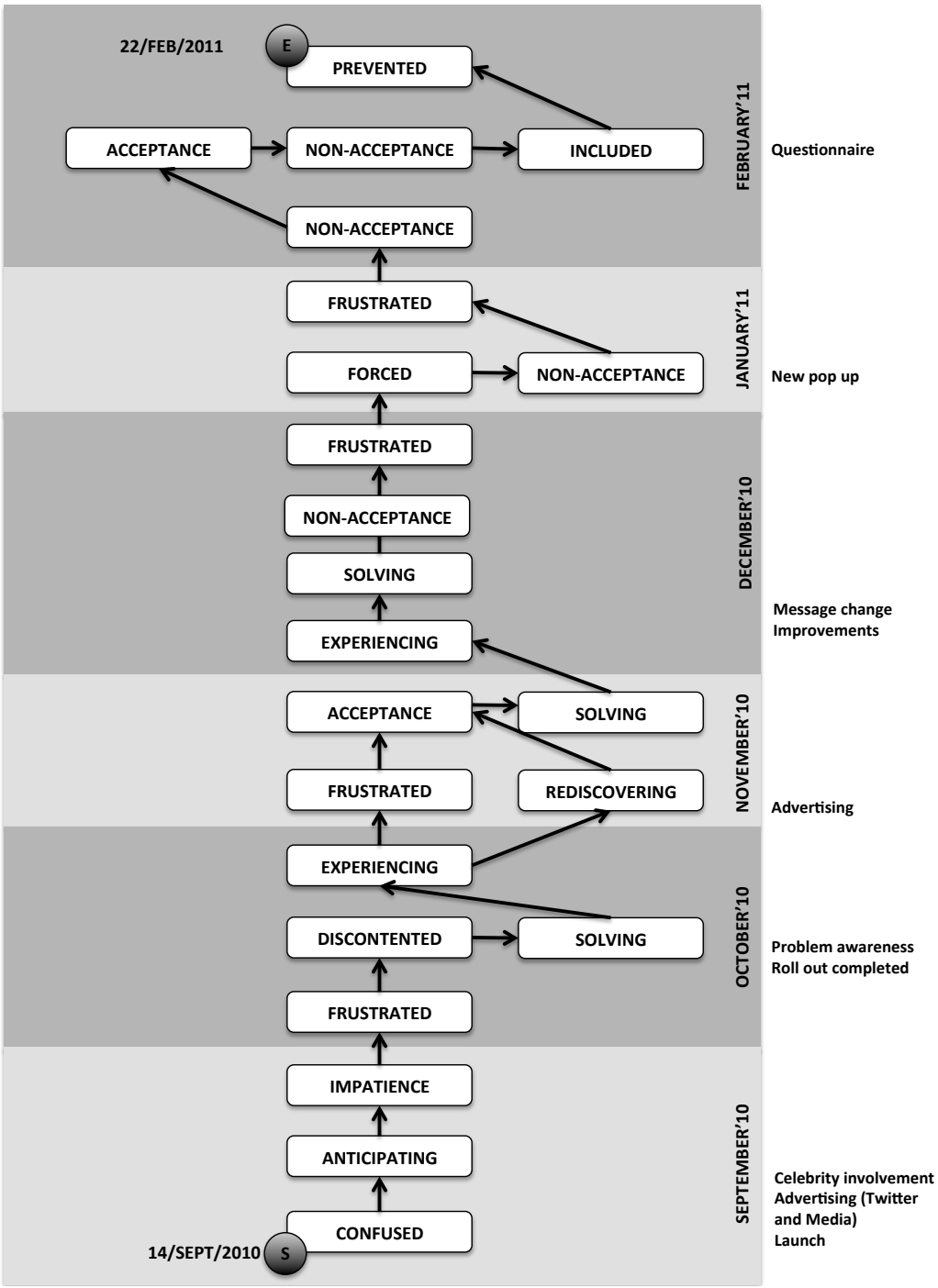


Figure 74. #NewTwitter user feelings chart.

5.6 Discussion

To answer research questions three, four and five (see chapter 1 section 1.4) a longitudinal OSN monitoring and analysis study was carried out. The study investigated how changes are introduced to OSNs, their effect on users and the factors that encourage change acceptance. The study was divided into two parts that investigated a real-world example of OSN change by observing the actions of an OSN change agent. Due to implacable timing, Twitter releasing a rapid restructure, this real-world example was chosen.

Part one of the study offered an overview of users reactions to change in the Twitter user interface (#NewTwitter). This was done by investigating tweets that referenced the #NewTwitter hashtag during six peaks (see chapter 5 section 5.3). However five of the six peaks occurred in the first three weeks of the Twitter change, this meant that the data did not provide a comprehensive detailed view of how the change occurred and users reactions to it, as the sample did not reflect the period equally or in its entirety. It was determined that a follow-up study was required.

The follow up study, an in-depth longitudinal OSN monitoring and analysis study, investigated user reactions to change in Twitter over the same six-month period. It used an event-sampling method where the first 100 tweets mentioning #NewTwitter on Tuesdays were collected, Tuesday was chosen because it is the most popular day for tweets accounting for 15.7% of tweets. Twenty-four events were identified and a total of 203,889 tweets were gathered and a sample of 2,400 tweets (first 100 tweets with the hashtag #NewTwitter from each Tuesday) were coded using the GIA to discover why users were tweeting about #NewTwitter.

The study found that most of #NewTwitter mentions occurred during the first four weeks of it's existence. The study also found that most of #NewTwitter mentions were negative (n= 1058 compared to positive, neutral and spam sentiments (n= 537, n= 302, n= 503)).

This was attributed to excessive problems with #NewTwitter (n= 374). As a result users either refused to try #NewTwitter or went back to the old user interface (#OldTwitter). This non-acceptance was

reinforced by Twitter's poor response to feedback, users were repeatedly asking for problem updates that were largely unanswered.

The study also found positive qualities for example the positive use of consultation during the latter stage of roll out and repeated use of change champions (fellow yet popular OSN users).

Additionally the study found that users experienced multiple feelings ranging from confusion to acceptance during Twitter's change approach. As a result a user feelings chart was developed. The chart offered a summary of Twitter users feelings during each event sample (interval). Each tweet from each sample was read repeatedly until an understanding of the users feelings covered in the tweets was achieved.

For example #NewTwitter was introduced to users through a public tweet, a YouTube advert and blog that offered basic information about the new user interface. Twitter also sent an invitation to media outlets to view #NewTwitter at their headquarters. After which media outlets began to offer opinions and screenshots of the new user interface. Such advertisement of the change resulted in the following user feelings: anticipation, confusion and impatience.

The chart also indicated the order in which feelings were displayed by Twitter users. For example twitter users were 'confused' about what #NewTwitter was. This became clear through advertisements that led to 'anticipation' however due to a lengthy roll out Twitter users grew 'impatient'.

Finally a by product of the study was a unique way to display OSN change and user reactions using a visualization tool (infographic). Similarly to part one (peaks) a category document table was reported. However in this instance the output was difficult to understand and report due to the large data set. Additionally the report method used in part one was largely statistical. This suggested the tweets were of secondary importance. To overcome this the category document table was consulted. The objective was to identify and explore patterns, for example the category "Help: Community" averaged 10 responses throughout the sample. However on 7 and 14 December 2010 this increased to n=48 and n=43 respectively.

The patterns were further explored and as a result key tweets that appropriately represented the pattern were identified, for example tweets from "Help: Community" on 7 and 14 December 2010 were collected and the key tweets were identified: "#NewTwitter just got newer with more photo's videos and music <url>" and "#Startup @embedly change, the face of twitter (for the better) <url> @masschalla #NewTwitter". Finally statistical charts that were based on the primary document table were developed, these illustrated users reactions, specifically category frequencies, throughout the sample.

As a result a 4.5 meters paper-based infographic was developed. The infographic illustrated the Twitter change approach and users reactions to the change.

5.6.1 Strengths

Similarly to part one the method used, longitudinal OSN monitoring and analysis, has become increasingly popular amongst researchers. They have produced work that offers an understanding of user requirements and engagement (Zabin and Jefferies (2008) and Scanfeld et al (2010)). As previously stated this work has not looked at how changes are introduced within OSNs, their effect on OSN users and the factors that encourage change acceptance.

Therefore the study alongside part one contributes substantial knowledge concerning the deployment of OSN change, specifically radical restructuring. It provides an understanding of a live approach to change and users reactions (alongside user feelings) and puts forward a unique way to display said data via an infographic. Thus this has been viewed as highly valuable.

Therefore the results from the study have further filled the gap in previous HCI research. Whilst also further answering research questions three and four: How are online social networks deploying change? How are online social network users experiencing and accepting change?

5.6.2 Weaknesses

The study presented two key weaknesses:

1. Similarly to part one the study does not distinguish individuals with cp however this does not diminish the value of the study because the OSN users include individuals with cp as study one and two identified. However the study creates a limitation because OSN users with cp are not distinguishable within the data set. This was attributed to OSN users with disabilities rarely disclosing their impairment within the technology. To overcome this future work is required that consults with the cp community to validate the findings presented. This limitation and future work is further discussed in chapter 10 section 10.3.

2. The study findings reflect radical restructuring on Twitter that use a specific change approach. As a result a key critique has emerged:

    1. Would OSN users react similarly if a different OSN change process was used?
    2. Would OSN users react similarly if the change represented weak restructuring?
    3. Would OSN users react differently to change within a different OSN?

To answer these questions it was determined that a follow-up study was required.

Chapter 6 – Study Four: Longitudinal Facebook monitoring and analysis

6.1 Introduction

The first study an exploratory interview study (see chapter 3), identified the reasons for OSN use and non-use and key themes including independence, privacy, trust, and change, together with challenges such as slow input speed, poor user interface features, lengthy and complicated tasks, lack of user interface personalization and unavailable or inappropriate within-website help.

As a result of the method a follow-up study, an in-context observational study, was carried out (see chapter 4). The study identified the OSNs and AT devices used, tasks carried out and users feelings during interaction. It was determined that changing OSNs prevent and or slows these users ability to communicate online whilst also not being represented adequately within HCI literature (see chapter 2 section 2.4).

To answer research question three how are OSNs deploying change? and four how are OSN users experiencing and accepting change?, a two part longitudinal OSN monitoring and analysis study of Twitter was carried out from 14 September 2010 to 28 February 2011 (see chapter 5). The study identified how OSN changes are introduced, their effect on users, and the factors that encourage OSN change acceptance and non-acceptance.

The study investigated a real world example of OSN change by observing the actions of Twitter and users reactions to #NewTwitter. The study also identified five key themes: inappropriate change approach; the inappropriate use of consultation and feedback and users experience, poor information concerning the change and problem solving; lengthy roll out of the new user interface; and the positive use of community champions. However the Twitter study was about a radical restructuring, resulting in the following questions: would OSN users react similarly if a different OSN change process was used, would OSN users react similarly to weak restructuring, and do OSN users react differently to change in a different OSN.

To answer these questions, a study that looked at the change process within another OSN was carried out. The study investigated the change process and users reactions to a change on Facebook, specifically the new photo-tagging feature. Due to implacable timing, Facebook deploying a weak restructure, this real-world example was chosen.

Furthermore the cp community was not distinguishable within the data set. This was attributed to Facebook users with disabilities rarely disclosing their impairment within the technology and the non-access of users non-public profiles, this limitation is further discussed in section 10.3.

This chapter discusses the study background, study questions, method, organization of data and the findings.

6.2 Background

In 2010, the most popular OSN was Facebook with over 400+ million users (Facebook Press Room, 2010). Facebook enables users to create and customise their own profiles with photos, videos, and information about themselves. Friends can browse the profiles of other friends and write messages on their pages (TechTerms, 2008) (see figure 1 and chapter 2 section 2.2.2), therefore Facebook users regularly experience user interface changes. As a result in 2012 Facebook released a change logbook for Facebook Platform API developers:

"At Facebook, we generally "push" new code to the production site every Tuesday night. We make this codebase available to developers on Sunday night at beta.facebook.com so they can test their applications prior to the push on Tuesday. You can access Graph API methods at graph.beta.facebook.com, and the REST API methods at api.beta.facebook.com. We make sure to inform Facebook Platform developers about any notable changes through our developer blog, but we know that even minor changes can sometimes impact developers, so we provide a change log for a given week" (Facebook, 2012: 1).

For example In September 2011 Facebook introduced three functional changes that included a revamped friend lists, real-time news ticker and a subscribe button . During the following month further changes that included a major overhaul of user profiles, new applications for playing music and watching videos were deployed (Parr, 2011 and Taylor, 2011).

This study focuses on a weak restructuring (small-scale change, see chapter 2 for discussion) that occurred during the same period as the Twitter study (see chapter 5).

On 15 December 2010 Facebook began to roll out an improved automated photo-tagging feature from manual to automatic using facial recognition. On release of this feature Facebook posted a public blog:Making photo tagging easier -http://www.facebook.com/blog.php post=467145887130 (see figure 88). The blog offered information about the new feature and allowed users to leave comments.


facebook
Search
Home
Profile
Find friends
Account
The Facebook Blog
Facebook Page
Subscribe to RSS feed
Making Photo Tagging Easier
by Justin Mitchell on Tuesday, 07 June 2011 at 20:17
UPDATE on Tuesday, June 7, 2011: We've been rolling Tag Suggestions out over the last several months and this feature is now available in most countries. We'll continue to post updates here as the roll-out progresses.
Every day, people add more than 100 million tags to photos on Facebook. They do it because it's an easy way to share photos and memories. Unlike photos that get forgotten in a camera or an unshared album, tagged photos help you and your friends relive everything from that life-altering skydiving trip to a birthday dinner where the laughter never stopped. Tags make photos one of the most popular features on Facebook.
While tags are an essential tool for sharing important moments, many of you have said tagging photos can be a chore. (Like that time you had to tag your cousin and her fiancé over and over and over again in 64 different pictures of their engagement party, and then go back and tag the guests.)
Since October, we've been working to make this process easier for you. First we added group tagging, so you could type one name and apply it to multiple photos of the same person. Now we're announcing tag suggestions, which will make tagging multiple photos even more convenient.
We've Suggested Tags for Your Photos
We've automatically grouped together similar pictures and suggested the names of friends who might appear in them. This lets you quickly label your photos and notify friends who are in this album.
Tag Your Friends
This will quickly label your photos and notify the friends you tag. Learn more
Who is this?
Francis Luu
Skip Tagging Friends
Save Tags
Because photos are such an important part of Facebook, we want to be sure you know exactly how tag suggestions work: When you or a friend upload new photos, we use face recognition software—similar to that found in many photo editing tools—to match your new photos to other photos you're tagged in. We group similar photos together and, whenever possible, suggest the name of the friend in the photos.
If for any reason you don't want your name to be suggested, you will be able to disable suggested tags in your Privacy Settings. Just click "Customize Settings" and "Suggest photos of me to friends." Your name will no longer be suggested in photo tags, though friends can still tag you manually. You can learn more about this feature in our Help Center.
Now if you upload pictures from your cousin's wedding, we'll group together pictures of the bride and suggest her name. Instead of typing her name 64 times, all you'll need to do is click "Save" to tag all of your cousin's pictures at once. By making tagging easier than before, you're more likely to know right away when friends post photos. We notify you when you're tagged, and you can untag yourself at any time. As always, only friends can tag each other in photos.
We'll be debuting tag suggestions to users in the United States over the next few weeks. Look for tags suggestions when you upload groups of photos that feature the same friends, and see how they can help you share life's occasions—large and small—every day.
Justin Mitchell, a Facebook engineer, is looking forward to spending more time making memories and less time tagging them.
Topics: Photos, Tagging
Search blog
Most popular stories
Making Photo Tagging Easier
13323 2556
Deals: Better with Friends
11310 3344
Sharing with Small Groups
11001 2021
Bringing Your Friends to Bing: Search Now More Social
764 408
The Wisdom of Friends (and Others Too)
14918 9540
Facebook Page
Facebook
Like
44,955,131
Facebook favourites
Help Center
Facebook Security
Facebook Developers Blog
Facebook Engineering
Facebook Ads
Facebook Marketing Solutions
Comment policy
We love your feedback, but be respectful and stay on topic. We reserve the right to delete profane, harassing, abusive and spam comments and to block repeat offenders. Read more.
Blog archive
Looking for a specific post? Visit our full archive of blog posts sorted by categories and dates.
Chat (Offline)

Figure 75. Screenshot of Facebook official blog post "Making photo tagging easier"

6.3 Study questions

The study questions addressed were:

1. What were the actions of Facebook during the period?
2. How did Facebook users react to the change process?
3. How was the change from manual photo tagging to auto-photo tagging accepted by Facebook users?
4. Is the inductive category model for examination of OSN change transferable to a weak restructuring process?

6.4 Change timeline

Initially a timeline was developed) that documented Facebook activities for example dynamic blog and media responses (see figure 91 and 92. The timeline provided an external birds eye view of how Facebook photo tagging progressed from manual to automated (see figure 90).

The timeline identified that the new feature was announced by Facebook on 15 December 2010. Additionally not all users had access to the new feature from the beginning. Deployment began within the the USA and was gradually rolled out to all Facebook users on 10 February 2010. It was also discovered that media outlets were concerned about the privacy and security of the new feature: "So even people who aren't on Facebook, or who choose not to identify themselves open in uploaded photo's, may nevertheless end up easy-to-find online" (Ducklin, 2010: 1).

This concern was echoed amongst users for example: "I would like to know why people can go into my photo's and tag photo's of my son for themselves. I really do not like that and do not appreciate that I cannot turn it off".

Furthermore media outlets and Facebook users were also concerned about the change process used. For example:

> "Dear Facebook,
>
> Why not lead the way on privacy?
>
> Become truly opt-in - not just on the basis that a new user opts in altogether by joining up in the first place, but on the basis that everything is locked down until a new user opens up each feature.
>
> Don't wait until the regulators in the world's developed economies start legislating to make you do so. Take the lead. People will love you all the more in the end" (Ducklin, 2010:1

As a result Facebook also encouraged users to comment on the blog. The timeline also identified that the Facebook change process was similar to Twitter. Facebook users were given the opportunity to switch between the manual and automated photo-tagging feature. However unlike Twitter change approach, Facebook users could choose not to commit to the new feature.

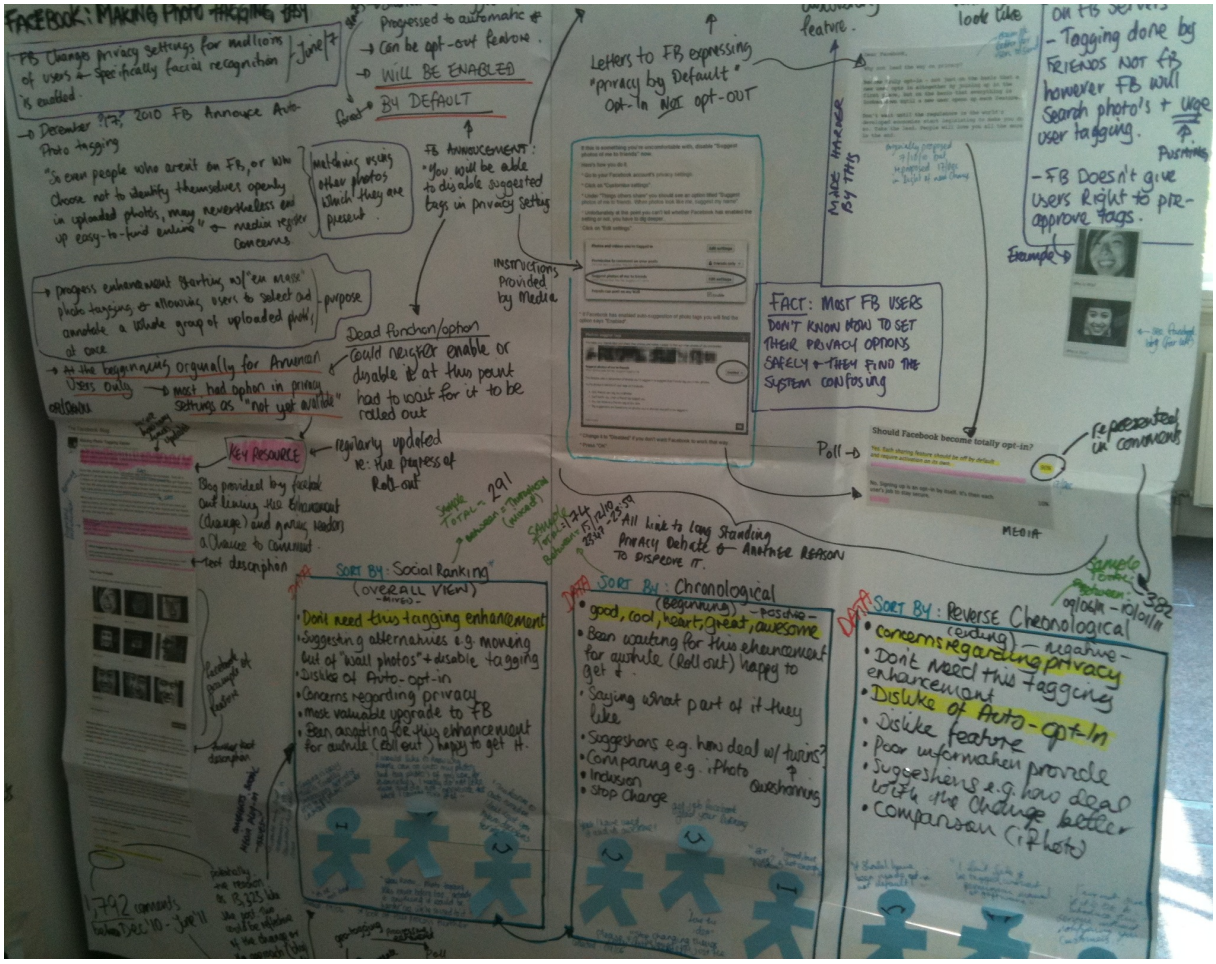


Figure 76. Developing timeline of new Facebook change process using flip-chart

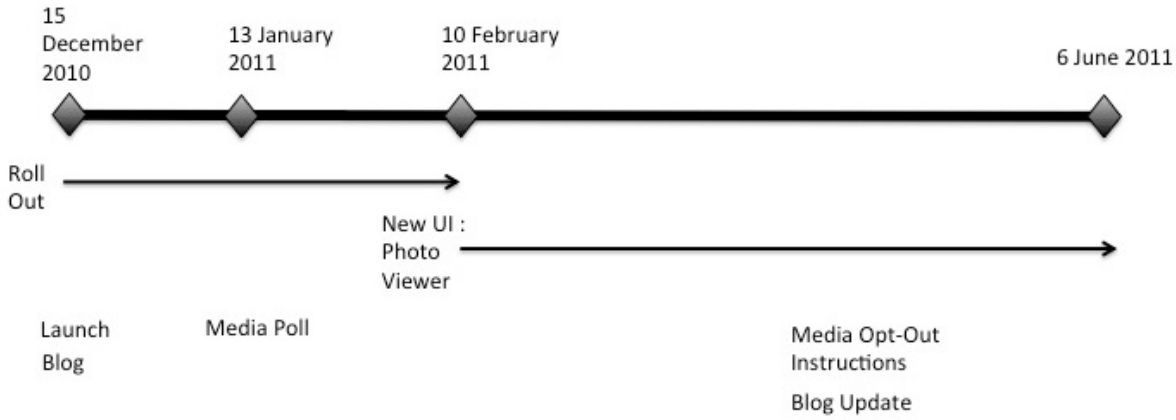


Figure 77. Timeline of Facebook new feature

6.5 Method

This section discusses the population of concern, data sample, method of selection and organisation of data.

6.5.1 Defining population of concern

The study was concerned with Facebook users that posted comments on "Making photo tagging easier" blog http://www.facebook.com/blog.php post=467145887130 (see figure 90).

6.5.1.1 Population statistics

In 2010, Facebook had 400 plus million users and 50% of Facebook active users logged in every day (Facebook Press Room, 2010). The average user had 130 friends and spent over 700 minutes on Facebook per month . There are over 900 million objects that Facebook users could interact with including pages, groups, events and community pages (Facebook Press Room, 2010 and Branckaute, 2011).

Additionally Facebook users shared over 30 billion pieces of content each month for example web links, news stories, posts, notes and photos and posted 500 million status updates each day (Branckaute, 2011).

There are 70 translations available on Facebook though the most common language was English. Additionally most users are located within the USA (111,212,840 users) followed by UK (23,449,100 users), Indonesia (19,528,560 users) and Turkey (18,679,460 users) (Facebook Press Room, 2010; Branckaute, 2011 and Fox, 2011).

6.5.1.2 Sample frame

The study gathered Facebook users reactions (comments) concerning the new auto tagging feature from a Facebook official blog post http://www.facebook.com/blog.php post=467145887130.

The comments were collected from 15 December to 6 June 2010. The sample contained 13,754 units specifically 431 comments and 13,323 likes. The blog comment box was used to sample the comments and likes (see figure 93). The comment box was divided into 3 areas: social ranking, chronological and reverse chronological. All divisions were collected.

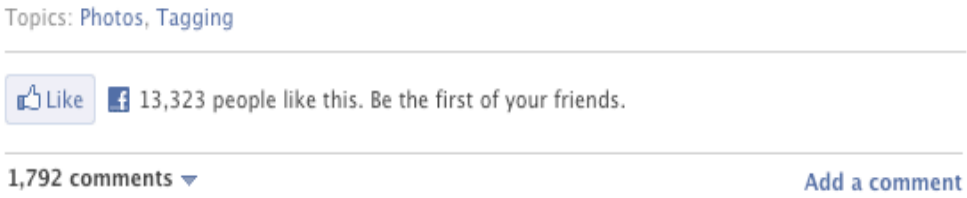


Figure 78. Screenshot of Facebook comment box

6.5.1.3 Sample method for selection

The Facebook official blog (http://www.facebook.com/blog.php post=467145887130) did not require a Facebook login to view comments. Therefore comments were judged as public and were gathered directly from the webpage.

6.5.1.4 Sampling and data collection

Similarly to study one to three GIA was used to organise the data (see chapter 2).

6.5.5 Data cleaning

The comments were copied to a Word document where miscellaneous characters, images and hyperlinks were removed. Each comment was compared to the Facebook comment box where missing characters were identified and added. The raw data files were then presented in a common format: .doc files, margin of 2.0 respectively, font: Times New Roman, font size: 10.

The Word documents were then uploaded into qualitative analysis software (Atlas.ti version 6) where unique identifiers were added and users hyperlinked Facebook names were expanded. The study only included comments written in English.

6.5.6 Close reading of text

The raw comments were read repeatedly until familiarisation and an understanding of the themes covered in the comments was achieved.

6.5.7 Expansion and removal of categories

The categories developed within study three were used to categorise the Facebook sample (see section 5.3.3.9). However some categories were not required because they were too specific to Twitter for example tweet type. Furthermore extra categories were required to reflect the type of change present in Facebook. For example 'privacy', due to the privacy issues surrounding the new feature (comments related to privacy appeared throughout the sample (see table 23)).

No.	Category	Description
56	Comment: Like	Comments that are liked by other Facebook users
57	*"Non-English" Bosnian*	*Comments not in English but in Bosnian*
58	*"Non-English" Filipino*	*Comments not in English but in Filipino*
59	*"Non-English" Polish*	*Comments not in English but in Polish*
60	*"Non-English" Turkish*	*Comments not in English but in Turkish*
61	Safety	Comments where reference is made to safety i.e. the safety of users and their information
62	Privacy	Comments where reference is made to safety i.e. the privacy of user information
63	*"Change" Commination - Non Acceptance*	*Comments where reference is made to a threatening to leave Facebook if the change occurs*

Table 22. Expansion: emerging categories and lower-level categories[19] (shown in italics)

[19] As with table 3 quotation marks reference category originality

6.5.8 Adjusting category model

The process of categorising the Facebook sample created eight additional categories (see table 23). The network diagram developed in part two of the Twitter study (see section 5.3.3.9) was adapted to include the expansion categories (see figure 94).

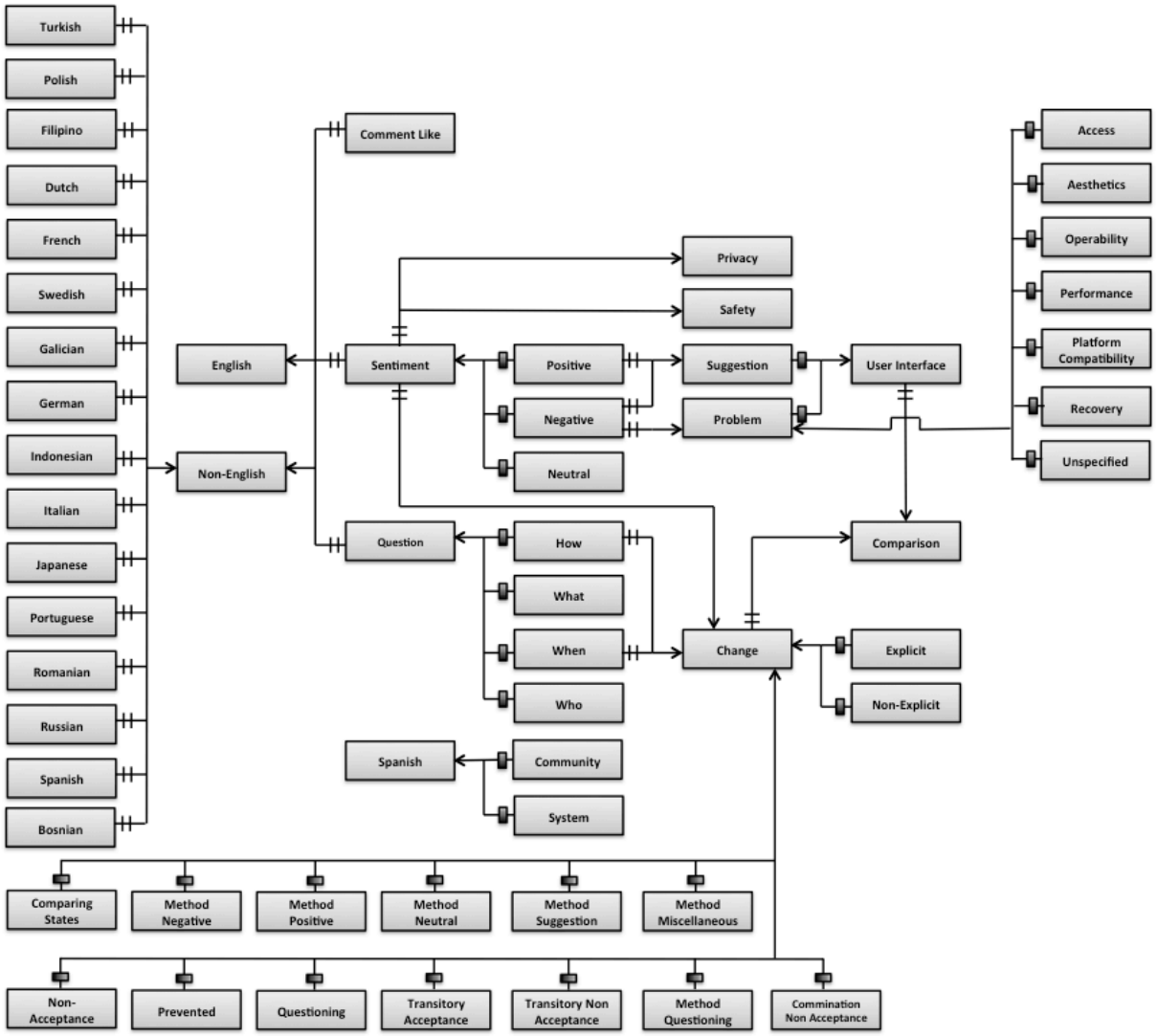


Figure 79. Adapted Facebook network diagram

6.5 Findings

The category primary documents (see table 24) alongside network diagram (see figure 94) and comments and likes was used to report the study findings (see appendix b section b.4 for data sample).

	PRIMARY-DOCUMENT			
CATEGORY	P35: Backward [Jan-Jun].txt	P36: Forward [Dec].txt	P37: Social Ranking [Throughout].txt	TOTAL
User Interface: Suggestion	44	0	13	57
Change: Commination - Non Acceptance	3	0	2	5
Change: Method - Negative	27	0	2	29
Change: Method - Neutral	2	0	0	2
Change: Method - Suggestion	6	1	1	8
Change: Non-Acceptance	5	0	18	23
Change: Non-Verbalized	65	0	22	87
Change: Prevented	1	0	0	1
Change: Questioning	9	0	5	14
Change: Transitory Acceptance	3	0	4	7
Change: Verbalised	2	0	0	2
Comment: Like	21	5	63	500
Comparison	3	2	6	11
English	126	53	124	303
Help: Community	9	4	16	29
Non-English	11	6	14	31
Non-English: Bosnian	0	0	1	1
Non-English: Dutch	2	0	0	2
Non-English: Filipino	2	0	3	5
Non-English: French	1	1	3	5
Non-English: German	2	0	0	2
Non-English: Indonesian	1	0	1	2
Non-English: Italian	0	0	2	2
Non-English: Polish	0	1	1	2
Non-English: Romanian	0	1	2	3
Non-English: Spanish	1	4	1	6
Non-English: Turkish	2	0	1	3
Privacy	32	0	8	40
Question: How	4	0	1	5
Question: What	11	3	4	18
Question: When	3	2	1	6
Safety	2	0	0	2
Sentiment: Negative	80	6	39	125
Sentiment: Neutral	33	4	20	57
Sentiment: Positive	11	42	44	97
Spam	21	5	32	58
UI Problem: Performance	1	0	1	2
UI Problems: Operability	12	3	8	23

User Interface: Problems	12	3	9	24
Spam	11	42	44	97
TOTAL:	570	136	472	1785

Table 23. Category-Documents Table

6.6.1 Demographic

The sample of 431 comments showed that 303 were written in English and 31 were written in other languages specifically Bosnian (*n*= 1), Dutch (*n*= 2), Filipino (*n*= 5), French (*n*= 5), German (*n*= 2), Indonesian (*n*= 2), Italian (*n*= 2), Polish (*n*= 2), Romanian (*n*= 3), Spanish (*n*= 6) and Turkish (*n*= 3). Additionally The findings also identified that 97 comments were spam.

Similarly to study three, the non-english comments were not used to report the findings (see chapter 5 section 5.5.3.6). As previous stated by Sugandhi, et al (2011) and expressed within study three part 1, such translations do not produce a good translation of text because recognition of whole phrases and their closest counterparts in the target language is needed. This meant the translated comments would not be naturally clear. Therefore the findings represent the 303 comments written in English.

6.6.2 Comments

The study found that 97 of the comments (*n*= 303) were positive compared to 125 negative and 81 neutral. The positive comments were at the beginning of December 2010 and related to users initial excitement about the new feature. Users suggested the feature was the most valuable upgrade to Facebook. Seven Facebook users described:

Example 1: “It’s ok... not bad”

Example 2: “Yeah I have used it and it’s awesome”

Example 3: “Good job Facebook glad you listening”

Example 4: “Love the idea”

Example 5: “Cool”

Example 6: “YES!. About time.”

Example 7: “It’s the easiest way to share our pictures thanks Facebook”.

Whilst other Facebook users were either expecting more from the new photo-tagging feature or were not in favour of it. Five Facebook users described:

Example 8: “Good, but not enough”.

Example 9: “not sure?”.

Example 10: “Hate it Hate it! One of the worse ideas FB has come up with EVER!”.

Example 11: “Do me a favour and use social networking aspect of website and let your user-base vote on functions like this. I personally feel like this is a step in the 1984 direction”.

Example 12: “It is a pointless update”.

However within two weeks Facebook users began to question the need for the new photo-tagging feature (*n*= 9), others were suggesting alternatives for example moving out of wall photos and disabling the automated deployment of the feature. Six Facebook users described:

Example 13: “Tagging is easy this is totally unnecessary. Get rid of this stupid photo viewer instead”.

Example 14: “You know... photo tagging was easier before too... actually it anything it would be harder cuz we’re so used to it...”.

Example 15: “Err twin problem?”.

Example 16: “Hate it hate it one of the worse ideas Facebook have come up with”.

Example 17: “Somewhere along the line, this will be just a way for FB to make more money from users. People haven’t asked for this, not a single person I know likes the feature, so why on Earth introduce it? Are we incapable of doing the tagging?”.

Example 18: "FB don't allow people to tag themselves on my pages I created. I suggest that Facebookers who liked my pages should able to tag themselves on photos I published and I have the power to remove them if they are not appropriate".

The study also found that Facebook users were disliking the frequent OSN changes. One Facebook user described:

Example 19: "Stop changing things please Facebook we loved you just the way you were".

Furthermore due to the roll out employed by Facebook during January 2011(one month after deployment) only a small proportion of Facebook users had access to the new automated photo tagging feature. This caused users to ask what it was (*n*= 11), when they would get it (*n*= 6), and how they could gain access to it (n=5). This resulted in users asking for help from other Facebook users (*n*= 16). Five Facebook users described:

Example 20: "what happens when you tag a picture of your dog as your friend, for a little laugh? do all your pictures of your dog now say "John Smith"?".

Example 21: "How do you do it? like how do you add it to be able to...? please tell (:"

Example 22: "Huh.... wat is dis?! =P".

Example 23: "When will this service be up and running?".

Example 24: "Will friends of friends be scanned using facial recognition software?".

The study also found that Facebook users that had access to the new automated photo-tagging feature were concerned about the privacy and safety of the feature, resulting in non-acceptance (*n*= 18). Nine Facebook users described:

Example 24: "I would like to know why people can go into my photo's and tag photo's of my son for themselves. I really do not like that and do not like that and do not appreciate that fault I cannot it of".

Example 25: "I don't like to be tagged without permission manual or software".

Example 26: “I am not sure it is OK to introduce this service without notifying your consumers!”.

Example 27: “omg! stop controlling me bye!”.

Example 28: “I don’t like this one bit! So if a random person takes a picture of me and uploads that picture to Facebook it will tell them who I am? If this is correct I call BULLS***! We do not need this! I might delete Facebook because of this. Facebook is fine just the way it is, stop trying to make it better.... One thing that I would like to see is the option to bock your photos so that no one (not even my friends) can right click and save your photos to their personal computers, if I recall right myspace had that option...that is a privacy setting that would be helpful not this face recognition c*!”.

Example 29: “Great. Trade privacy for laziness”.

Example 30: “So FB, when are you going to address the very real privacy concerns with this feature? Lets use a short scenario to see where this could lead. Lets say I’m on the train and Creepy Person, who happens to be a friend of a friend, notices me. They take a photo with their cell phone, upload it to Facebook... and Facebook’s handy-dandy facial recognition says “this looks like Denise!” Gee, thanks for allowing Creepy Person to find out my name and perhaps other clues to my identity. In general, I wish that Facebook would allow people to approve tags BEFORE they go live; you should not have to be alerted and remove them after the fact. You should not have to worry about your identity being splashed online because someone decided to take a photo of you at a party and upload it.”.

Example 31: “Facebook proved one more time how disrespectful they are towards their users, by activating by default this feature (which concern our privacy)!”.

Example 32: “Why are you allowing tagged photos to be published without the consent of the people that are tagged. You are in direct violation of Facebook own “Statement of Rights and Responsibilities” <url>: 5. Protecting Other People’s Rights” “We respect other people’s rights, and expect you to do the same.” (9) “You will not tag users or send email invitations to non-users with their consent.” You add Facebook features (most of them we do not want) with the security and privacy default settings set as lax as they can possibly be set. Instead of the defaults set to Everyone and/or Enabled, the default settings should be Only Me and/or Disabled. It should be up to the users to hunt down where you have hidden the settings if they

want to loosen the settings, instead of users trying to hunt down where you have the settings hidden in order to tighten settings to protect our privacy and security!!!".

In February 2011 users began to question and dislike the change approach Facebook had deployed. Users were unhappy about default opt-out (*n*= 27). Whilst others were suggesting and opt in feature (*n*= 44). Seven Facebook users described:

Example 33: "This feature is auto turned on I don't want you making decision for me".

Example 34: "It should have been made opt-in not default".

Example 35: "Facebook clearly doesn't care about the privacy of it's users. Fortunately, many people and governments have huge issues with privacy invading stuff like this being turned on by default and being forced to Opt-Out. Ironically, oppressive governments and regimes love this "feature" as it helps them to figure out the identities of protesters.".

Example 36: "Can Facebook not get anything right in regard to features and how people use them? It not the feature that is the problem but the face that Facebook as not given use the option to turn it on or off before it's rolled out. A simple pop up option of finding out what the feature is and a simple".

Example 37: "would you like to activate this feature - yes or no option rather than just setting everything to ON".

Example 38: "...Rather like the clever new advertising system (and lets face it, it is an advert system, not a recommendation system) you will be rolling out globally. I would say that 99% of users DO NOT want that feature and want the option to turn it off, I know you can turn it off, but we should have the choice before it's switched on and we should not have to go hunting for the option".

Example 39: "*Sniff Sniff* Smells like.... male bovine manure... I wonder why... oh because this is BULLS***! It should not be "Opt OUT" It should be "Opt IN* Forcing people to "Opt out" of a "service" they don't want should illegal!".

Furthermore the study found that after roll out Facebook users were asking for help from the community to opt out of the new feature (*n*= 29). However there were instances where users asked Facebook directly, these comments were left unanswered. One Facebook user described:

> **Example 40:** "Quote FB [Facebook] as saying they have had "almost no user complaints.".

The study also found that Facebook users were reiterating concerns about the privacy and safety of the feature alongside user interface problems specifically operability (*n*= 23) and Facebook change approach specifically default feature opt-out. Five Facebook users described:

> **Example 41:** "The new Facebook update sucks!!!!! I can't even find my status immediately...".
>
> **Example 42:** "Facebook = FaceBUG".
>
> **Example 43:** "FACEBOOK TEAM, it's right that it make us tag the pictures easier but it's annoying because the comment for one pictures it's go through all the picture of the entire album!!!".
>
> **Example 44:** You must install a setting to stop tagged photos from being injected into my account. I have been spam-tagged with advertising images. It is IMPOSSIBLE to remove them from my profile. Second: If somebody wants to tag me, and you should show it in a "tagged photos", not feed it into my profile page by default. That is an invitation for hateful abuse. It should NOT show up on my profile unless I specifically put it there. Third: when I mark a tagged photo as spam and block the user, it DOES NOT remove the from my profile. I have one tagged spam photo <URL> where I blocked the user and reported it as spam, and cannot remove it from my profile.".
>
> **Example 45:** "Everytime I post a photo of myself it ask me if I am someone else... its f****** annoying".

Finally the study found that the information provided by Facebook throughout the change approach was inappropriate. Two Facebook users described:

Example 46: “it’s VERY annoying, imho. And it’ even more annoying because I learned about this feature by chance. I immediately disabled it, but I think that they should have asked me/us.”.

Example 47: “1. where is the dislike button? 2. why you always make changes for all of your user without any information, so one can only learn it by accident? 3. why do you think all your user are idiots who believe in your foolish explanations?”.

6.6.3 Likes

The study found that 13,323 ‘likes’ were posted and 500 were connected to Facebook users comments. It was inferred that people that liked the blog posted also liked the new feature. However this could not be confirmed and thus only the 500 likes connected to comments are reported in the findings.

The study found that most of the comments related to Facebook users dislike of the automated photo tagging feature, they were especially concerned about the privacy of the new feature. The comments that articulated this concern were liked by other Facebook users for example:

Example 48: “Tagging is easy. This is totally unnecessary. Get rid of this stupid photo view instead” (7 likes).

Example 49: “get rid of tagging” (23 likes).

Example 50: “Sorry - but we DOn’t need tagging. I know the people on the picture or I don’t... I don’t want that everybody who s watching photos of me... is able to find my profile... Its just Facebook and not a book of my life. Zuck said... privatsphere is a step to wrong direction... it isn’t...” (331 likes).

Example 51: “I want to be able to approve what photo’s I’m tagged in before they get published” (31 likes).

The study also found that users were concerned about the opt out process used by Facebook. They suggested an opt-in process would be more appropriate. The comments that articulated this concern were liked by other Facebook users for example:

> **Example 52:** "You have a right not to participate..." (7 likes).
>
> **Example 53:** "This feature is automatically turned on. I don't want you to make decisions by auto when it comes to privacy related functions. You are the biggest, most fantastic social network on the planet already. It'd suit you guys well to keep a certain balance between FUN and PROFIT. Meaning: respect users privacy! Sometimes I really DISLIKE this place " (13 likes).

Finally the study found that Facebook users were experiencing problems with the new feature, and were making suggestions about how they could be resolved. The comments that articulated this concern were liked by other Facebook users for example:

> **Example 54:** "One more! I also hate the fact that it say _____ tagged you in 100 pictures... when you click it you only see one picture.... you have to scour your friend's album or your tagged photos for the other 99. can't you create a feature which when the notification is clicked all 100 photos will be shown in a lightbox or something? that would be easier than counting to 100..." (3 likes).
>
> **Example 55:** "I think a list of all ur friends should come up when you clink on a tag photo so u can tag everyone u want 2 @ one time..." (6 likes).

The Facebook study identified comparable issues to the Twitter study. For example poor information concerning the change approach, excessive user interface problems during OSN change and a lengthy roll-out approach. The study also found a comparable positive specifically use of consultation and feedback. Additionally the study identified that the opt-out approach deployed by Facebook was inappropriate.

As a result the study reconfirmed the findings from the Twitter study. This suggests that OSN users reactions are similar regardless of whether a radical or weak OSN restructure.

6.6.4.3Inductive category model to examine online social network change

The inductive category model (see table 25) was initially developed during the study 3 (see chapter 5). The model was tested for trustworthiness using a category consistency check (see chapter 5 section 5.2.7.3) and then used to reexamine Twitter users reactions to #NewTwitter where expansion categories were added to meet the new criteria of the study (see chapter 5 section 5.3)

The inductive category model was then used in a different OSN change deployment setting, Facebook (see chapter 6), where expansion and removal of categories took place (see chapter 6 section 6.5.6). For example Twitter tweets were presented as updates, @ mentions or retweets (see table 14). Whilst Facebook comments were presented as replies to the OSN blog post or other users comments. As a result the model was altered 'comments: like' was added and 'tweet: type' was removed (see table 22).

Furthermore the scale of OSN change, from radical to weak restructure plus the change itself, meant the model needed to be altered. For example the Facebook study added 'safety' and 'privacy' to convey users responses to the new photo-tagging feature (see chapter 6 section 6.5.7).

As a result this PhD research puts forward an inductive category model that can be used to investigate OSN change. The inductive category model acts as a starting point for future OSN change researchers. It offers high level data codes which can be used to analyse OSN data related to change. Table 25 provides a list of codes (with their descriptions) that researchers can consider. Forty-two categories have been identified, These cover language, text unit type, sentiment, user interface problems, questioning, explicit and non-explicit change, help and sub-topics (see table 25). The following network diagram offers an understanding of each code relationship i.e. provides a visual map of the code space (see figure 95).

No.	Category	Description
1	English	Text unit in English
2	*"Type" [Text unit type]*	*Text unit that denote a OSN message for example tweet: @ mention, retweet, update; or message: update, like or reply. This also includes Spam*

No.	Category	Description
3	*"Type" Spam*	*Text unit where no reference is made to OSN change*
4	Sentiment	Text unit that denote a particular attitude (positive, negative or neutral) with respect to the change or the overall tonality of the text unit.
5	*"Sentiment" Positive*	*Text unit where the overall attitude is positive*
6	*"Sentiment" Negative*	*Text unit where the overall attitude is negative*
7	*"Sentiment" Neutral*	*Text unit where the overall attitude is neutral*
8	Question	Text unit where reference is made to a question asked or answered by a user
9	*"Question" What*	*Text unit where a questions is asked or answered related to what OSN change is*
10	*"Question" When*	*Text unit where a questions is asked or answered related to when OSN change is available*
11	*"Question" How*	*Text unit where a questions is asked or answered related to how to get OSN change*
12	*"Question" Who*	*Text unit where a questions is asked or answered related to who has OSN change*
13	Change	Text unit where reference is made to OSN change i.e. process twitter used, feelings regarding change or intended actions
14	*"Change" Explicit*	*Text unit where reference is explicitly made to OSN change for example approach used, feelings regarding change or intended actions*
15	*"Change" non-Explicit*	*Text unit where reference is not explicitly made to OSN change i.e. approach used, feelings regarding change or intended actions*
16	*"Change" Comparing States*	*Text unit where reference is made to OSN change specifically comparing the old user interface to the new user interface or vice versa.*
17	*"Change" Method: Negative*	*Text unit where reference is made to OSN change specifically a negative comment/feedback regarding the approach used*
18	*"Change" Method: Positive*	*Text unit where reference is made to OSN change specifically a positive comment/feedback regarding the approach used*
19	*"Change" Method: Neutral*	*Text unit where reference is made to OSN change specifically a neutral comment/feedback regarding the method twitter used*
20	*"Change" Method: Questioning*	*Text unit where reference is made to OSN change specifically questioning the approach used*
21	*"Change" Method: Suggestion*	*Text unit where reference is made to OSN change specifically offering a suggestion to improve or an alteration regarding the approach used*
22	*"Change" Miscellaneous*	*Text unit where reference is made to OSN change but does not have a specific focus or change is explicit but unrelated*
23	*"Change" Non-Acceptance*	*Text unit where reference is made to OSN change specifically user non acceptance*
24	*"Change" Prevented*	*Text unit where reference is made to OSN change specifically access to the change is prevented*
25	*"Change" Questioning*	*Text unit where reference is made to OSN change specifically questioning the necessity/reasoning for the change*

No.	Category	Description
26	*"Change" Transitory Acceptance*	*Text unit where reference is made to OSN change specifically users likes or dislikes the change but has used the new user interface for a temporary time because they wanted to try it or they felt the OSN change was going to happen and the felt they should get used to it. They have since accepted the change*
27	*"Change" Transitory Non-Acceptance*	*Text unit where reference is made to OSN change specifically users likes or dislikes the change but has used the new user interface for a temporary time because they wanted to try it or they felt the OSN change was going to happen and the felt they should get used to it. They have since not accepted the change and returned to the old user interface*
28	*"Change" Commination - Non Acceptance*	*Text unit where reference is made to threatening to leave the OSN if the change occurs*
29	"User Interface" Problem	Text unit where reference is made to the user interface specifically problems
30	*"User Interface Problem" Access*	*Text unit where reference is made to the user interface problems specifically accessibility for example user has a problem accessing the new user interface*
31	*"User Interface Problem" Aesthetics*	*Text unit where reference is made to the user interface problems specifically aesthetics (appearance) of the new user interface for example user dislikes visual appeal or problem with the appearance e.g. background not being seen*
32	*"User Interface Problem" Operability*	*Text unit where reference is made to the user interface problems specifically operability of the new user interface for example allowable functions are not working as expected*
33	*"User Interface Problem" Performance*	*Text unit where reference is made to the user interface problems specifically performance of the new user interface for example response time*
34	*"User Interface Problem" Platform Compatibility*	*Text unit where reference is made to the user interface problems specifically compatibility of the new user interface on different platforms for example browsers, operating systems, internet speed and mobile devices*
35	*"User Interface Problem" Recovery*	*Text unit where reference is made to the user interface problems specifically how the new user interface recovers from reported issues*
36	*"User Interface Problem" Unspecified*	*Text unit where reference is made to the user interface problems but does not have a specific focus*
37	*"User Interface" Suggestion*	*Text unit where reference is made to the new user interface specifically suggestions for improvements*
38	*"Help" Community*	*Text unit where reference is made to help specifically user asking other OSN users for help to use or not use the new user interface. This also includes media offering external sources providing help*
39	*"Help" System*	*Text unit where reference is made to help specifically user asking the system for help to use or not use the new user interface*
40	[Emerging categories]	Text unit where reference is made to a sub topic that is related to OSN change and is not covered within this model for example safety, privacy, trust etc.
41	Comparison	Text unit where reference is made to other OSN, API's, systems, websites or change events

Table 24. Inductive category model to investigate OSN change

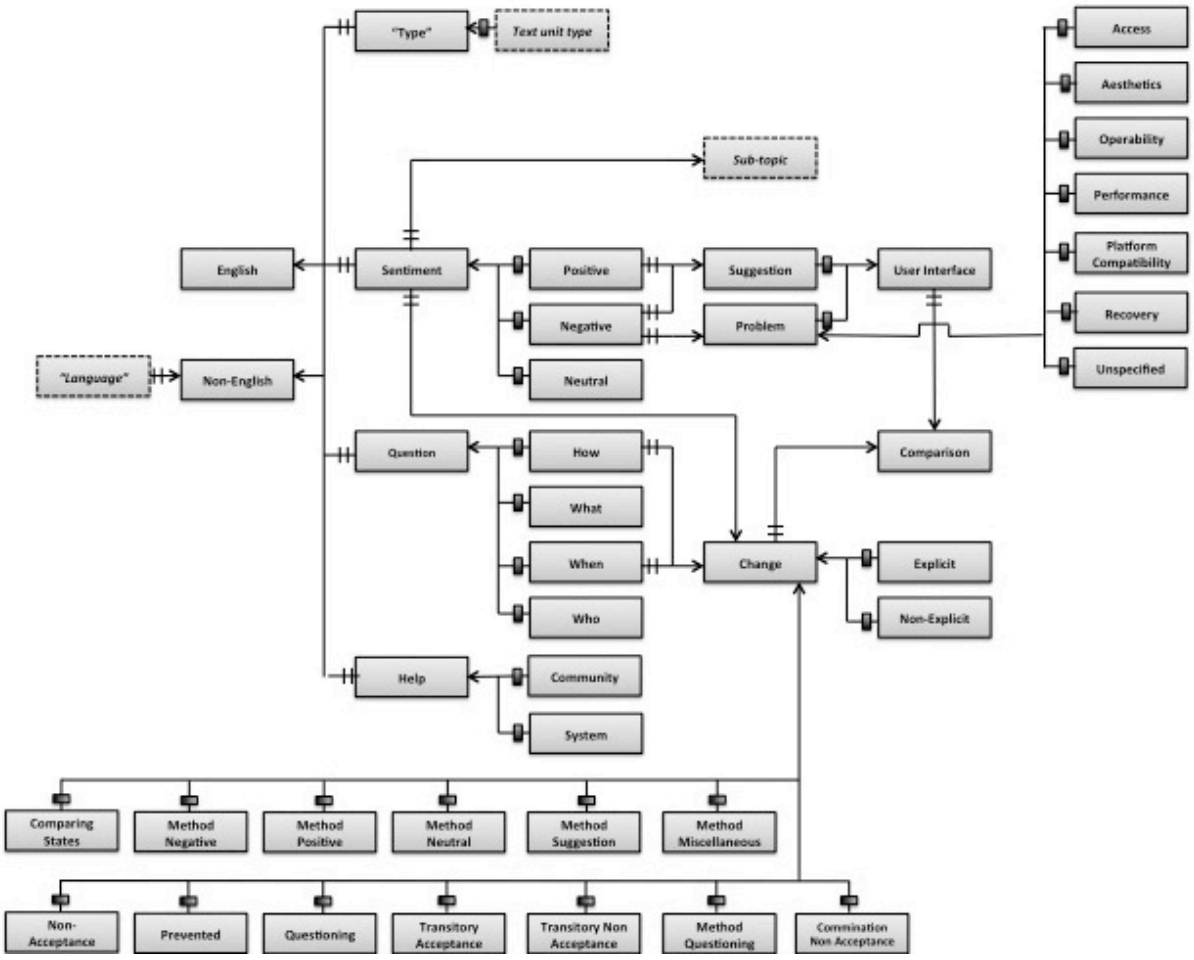


Figure 80. Network diagram: inductive category model to investigate OSN change.

6.6.4 Discussion

To answer research question three and four: how are OSNs deploying change? how are OSN users experiencing and accepting change? a longitudinal OSN monitoring and analysis study was carried out from September 2010 to February 2011. The study identified how an OSN change is deployed, its effect on users, and the factors that encourage change acceptance and non-acceptance. The study investigated a real world example of OSN change by observing the actions of Twitter and its users reactions to the change from #OldTwitter to #NewTwitter. The study was divided into two parts:

- An overview of users reactions to change within Twitter user interface (#NewTwitter), this was done by investigating tweets that referenced the #NewTwitter hashtag during peaks,
- A more in-depth look at users reactions to change in Twitter over a 6-month period using an event-sampling method where the first 100 tweets mentioning #NewTwitter on Tuesdays were collected and analysed.

The findings from both parts of the study reflected radical restructuring on Twitter that used a specific change approach. As a result a key critique has emerged:

- Would OSN users react similarly if a different OSN change process was used?
- Would OSN users react similarly if the change represented weak restructuring?
- Would OSN users react differently to change within a different OSN?

To answer these critiques it was determined that a follow-up study, a longitudinal OSN monitoring and analysis study that focused on weak restructuring, was required. The study investigated the change approach and users reactions on a popular OSN (Facebook). Similarly to study three, due to implacable timing, Facebook releasing a weak restructure, this real-world example was chosen.

On 15 December 2010 Facebook began to roll out an improved photo-tagging feature that changed from manual to automatic photo-tagging using facial recognition. On release of this feature Facebook posted a public blog “Making photo tagging easier”. This offered information about the new feature and allowed users to give feedback.

Blog responses from 15 December 2010 to 4 June 2011 were collected. A total of 13,754 units specifically 431 comments, and 13,323 likes. The comments were coded using the inductive category model developed within the Twitter monitoring and analysis study to discover why users were discussing the new photo-tagging feature.

The study found that 97 of the comments were positive compared to 125 negative and 81 neutral (*n*= 303 total comments, the remaining comments were spam). The positive comments were at the beginning of December 2010 and related to users initial excitement about the new feature. Users were suggesting the feature was the most valuable upgrade to Facebook. Whilst other users were either expecting more from the new feature or were not in favour of it. However within two weeks Facebook users began to question the need for the new feature (*n*= 9), others were suggesting alternatives such as moving out of wall photos and disabling auto-tagging.

The study also found that Facebook users disliked the OSNs frequent changes. Furthermore due to the roll out approach employed by Facebook by January 2011 (one month after its launch) only a small proportion of Facebook users had access to the automated photo-tagging feature, this resulted in users asking what it was (*n*= 11) when they would get it (n=6) and how they could gain access to it (*n*= 5), resulting in users asking for help from other Facebook users (n=16).

The study found that Facebook users who had the automated photo-tagging feature were concerned about the privacy and safety of the new feature, this increased non-acceptance (*n*= 18).

During February 2011 users began to question and dislike the change approach Facebook deployed. Facebook users were unhappy about the default opt-out (*n*= 27). Whilst others were suggesting an opt-in process (*n*= 44).

The study found that after roll out Facebook users were asking for help from the community to opt-out of the new feature (*n*= 29). There were instances where users asked Facebook directly but these comments were left unanswered.

Furthermore the study found that Facebook users were reiterating concerns about the privacy and safety of the new feature, user interface problems specifically operability (n= 23) and default opt-out. The study also found that the information provided by Facebook throughout the change process was inappropriate.

The study identified comparable issues in the third study. For example poor information concerning the change process, excessive user interface problems during OSN change and a lengthy roll-out process. The study also found a comparable positive: use of consultation and feedback.

Finally the study identified that the opt-out approach deployed by Facebook was inappropriate. Thus the study confirmed the findings from the third study. This suggests that OSN users reactions are similar regardless of whether its a radical or weak restructure and is irrespective of the OSN used.

Finally a by product of study three and four was the inductive category model to examine OSN change. The inductive category model that can be used to investigate OSN change. The inductive category model acts as a starting point for future OSN change researchers. It offers high level data codes which can be used to analyse OSN data related to change.

6.6.4.1 Strengths

Similarly to study three the method used, longitudinal OSN monitoring and analysis, has become increasingly popular amongst researchers. They have produced work that offers an understanding of user requirements and engagement (Zabin and Jefferies (2008) and Scanfeld et al (2010)). As previously stated this work has not looked at how changes are introduced within OSNs, their effect on OSN users and the factors that encourage change acceptance.

Study three contributes substantial knowledge concerning the deployment of OSN change, specifically radical restructuring. It provides an understanding of a live approach to change and users reactions (alongside user feelings) and puts forward a unique way to display said data via an infographic. Study four substantially adds to this by further exploring deployment of OSN change, specifically weak

restructuring, within a different OSN and change deployment setting thus reconfirming the findings from study three. Thus the findings from this study has been viewed as highly valuable.

Therefore the results from the study have further filled the gap in previous HCI research. Whilst also further answering research questions three and four: How are online social networks deploying change? How are online social network users experiencing and accepting change?

6.6.4.2 Weaknesses

The study presented two key weaknesses:

1. Similarly to study three, this study does not distinguish individuals with cp however this does not diminish the value of the study because the OSN users include individuals with cp as study one and two identified (see chapters 3 and 4). However the study creates a limitation because OSN users with cp are not distinguishable within the data set. This was attributed to OSN users with cp rarely disclosing their impairment within the technology and the non-public nature of Facebook profiles (cp status could not be observed). To overcome this future work is required that consults with the cp community to validate the findings presented. This limitation and future work is further discussed in chapter 10 section 10.3.

2. Studies three and four investigated how an OSN change is deployed, its effect on users, and the factors that encourage change acceptance and non-acceptance in both a radical and weak restructuring setting. However the studies did not explicitly identify how OSN users would like to experience change. Therefore it was determined that a follow-up study was required.